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THE AMERICAN MIDLAND NATURALIST

Monograph No. 4

THE AMERICAN MIDLAND NATURALIST

Monograph Series

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THE AMERICAN MIDLAND NATURALIST

Monograph No. 4

Edited by John D. Mizelle

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Woody Plants of the Western National Parks

Containing keys for the identification of trees and shrubs

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By

VIRGINIA LONG BAILEY

Instructor, Department of Biology,
Wayne University, Detroit, Michigan,

and

HAROLD EDWARDS BAILEY

Assistant Professor of Botany,
College of Pharmacy,
Wayne University, Detroit, Michigan

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Woody Plants of the Western National Parks

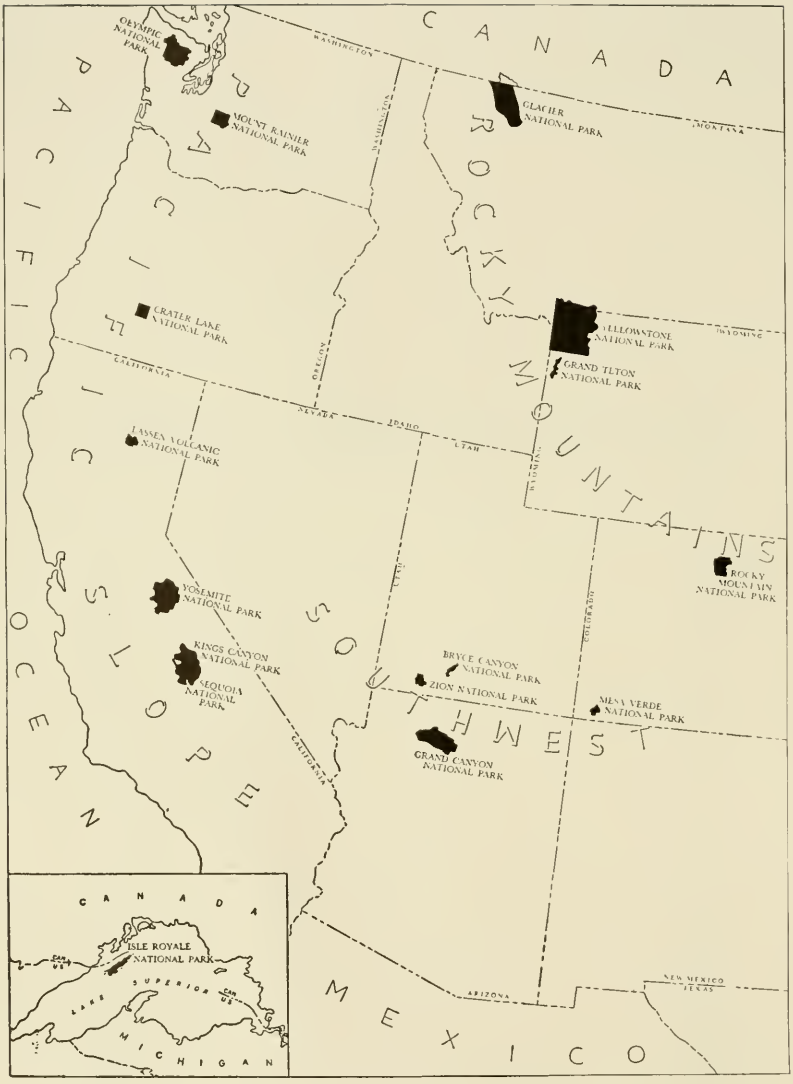

Fig. 1. Map of western United States and Lake Superior inset.

Woody Plants of the Western National Parks

Introduction

To many people the national parks and other recreational areas are centers of botanical interest and they will become increasingly so as more is learned about the floras. In travelling from one area to another similarities and differences in the vegetation are noted. Many of the sixteen national parks discussed here have bulletins dealing with the plants of the particular areas, but no single guide has been available for use in all. Located as they are in different parts of the Cascades, Sierra Nevada, Rocky Mountains, Colorado Plateau, and in the Lake Superior Region, the vegetation is representative of much larger areas than those outlined by the park boundaries and hence, this guide should prove useful to those interested in floras of the general regions as well as the national park areas. There are represented here coastal, mountainous, desert, lake, and swamp types, species of northern, middle, and southern latitudes, and of elevations ranging from a few hundred feet to 14,500 feet above sea level. A total of over 560 woody plants are listed for these national parks, the areas of which total roughly 11,600 square miles.

The report is based on field observations and plant collections made during a vegetation survey carried on under the direction of the Division of Forestry of the United States National Park Service. Several weeks to several months were spent by the authors in most of these areas either in connection with the survey or while engaged in research and education work. In this part only the shrubs are considered in detail, the section on trees having been previously published.[1] However, in order to broaden the scope of the work and thus increase its usefulness, a key to the trees is included.

Since the bulletin will be used by the laymen interested in plants seen in the national parks, certain technical terms have been avoided and uses of plants and other items of interest have been often included. Also, in the interest of the standardization of English as well as Latin names, the nomenclature used is, in general, in accordance with that set down by the American Joint Committee on Horticultural Nomenclature.[2]

We wish to express our appreciation to the many officers and men of the National Park Service who have so generously cooperated in the promotion of this project. Special mention should be made of the Division of Forestry under whose supervision the vegetation surveys were made and for permission to use certain vegetation data. Acknowledgments are also made to the park naturalists for their cooperation in checking plant lists for their particular areas. Park floras and other lists which have proved of great value in the compilation of this work are marked with an asterisk in the bibliography.

1 Bailey, H. E. and V. L., Forests and Trees of the Western National Parks. United States Department of the Interior, Conservation Bulletin no. 6. 1941.

2 American Joint Committee on Horticultural Nomenclature, Standardized Plant Names. Second Edition. 1942.

Regions

In comparing the vegetation of the western national parks and Isle Royale it should be noted that these areas are widely distributed over major physiographic regions of the West, fig. 1.

PACIFIC SLOPE REGION

Pacific Northwest
Olympic National Park
Mount Rainier National Park

Southern Cascades
Crater Lake National Park
Lassen Volcanic National Park

Sierra Nevada
Yosemite National Park
Kings Canyon National Park
Sequoia National Park

ROCKY MOUNTAIN REGION

Northern Province
Glacier National Park

Middle Province
Yellowstone National Park
Grand Teton National Park

Southern Province
Rocky Mountain National Park

SOUTHWEST REGION

Mesa Verde National Park
Bryce Canyon National Park
Zion National Park
Grand Canyon National Park

GREAT LAKES REGION

Isle Royale National Park

PACIFIC SLOPE REGION

The national parks of the Pacific Slope are located in a portion of the western chain of mountains which extends from Alaska to Mexico. They range from Olympic and Mount Rainier National Parks in northern Washington, through the southern Cascades in which are located Crater Lake and Lassen National Parks, to Yosemite, Kings Canyon, and Sequoia National Parks in the southern Sierra Nevada. As one follows the crest of the main mountain range from north to south, it may be observed that elevations become steadily higher, increasing from 4,000 to 6,000 feet in the north to 10,000 to 14,500 feet in the south. This is exclusive of the volcanic peaks of the Cascade Range which ascend to much greater heights than the crest of the range. Timberline also becomes increasingly higher as one moves southward. At Mount Rainier the limit of trees is at about 6,000 feet while in Sequoia National Park trees are found growing at almost twice that altitude.

The Pacific Northwest is characterized by exceedingly dense and luxuriant forests exemplified in the two national parks of northwestern Washington, Olympic and Mount Rainier National Parks. These two areas are only about 100 miles apart airline, the former in the Olympic Mountains near the coast and Mount Rainier further inland in the Cascade Mountains. The relatively mild moist climate is due to the direct influence of the moisture-bearing winds from the Pacific Ocean which tend to modify the temperatures of the areas surrounding these glacier-covered peaks.

To the south in the southern Cascades, which are separated from the coast

by the great interior valleys and coastal mountain masses, the rainfall is less and the climate more severe than in the Pacific Northwest. Hence the forests, while more dense and luxuriant than those of the Rocky Mountains and Southwest, do not measure up to those of Mount Rainier and Olympic National Parks. In this section are located Crater Lake and Lassen Volcanic National Parks.

Still further south, in the Sierra Nevada range of California, are three other national park areas, Yosemite, Kings Canyon, and Sequoia. The distance airline from the northern boundary of Yosemite National Park to the southern boundary of Sequoia National Park is approximately one hundred miles. In between these two and adjoining Sequoia National Park lies Kings Canyon National Park, which also includes the area formerly designated as General Grant National Park. All have their eastern boundaries along the crest of the Sierra Nevada.

OLYMPIC NATIONAL PARK

The Olympic Peninsula, within which is located Olympic National Park, is bounded on three sides by water. On the side next to the Pacific Ocean is recorded the highest annual rainfall of any place in the United States, with as much as 144 inches per year at the northwestern edge of the park. This is in decided contrast to the 25 inch figure recorded for Port Angeles, where park headquarters are located. Elevations range from 500 feet elevation on the coastal side to 7,930 feet at the top of the snow capped Mount Olympus. Rivers radiating out from all sides of the park are headed by active glaciers fed by enormous amounts of snowfall which may reach as much as 250 feet per year.

Dense coastal forests of Douglas fir (*Pseudotsuga taxifolia*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*) and Sitka spruce (*Picea sitchensis*) follow the river valleys up into the park on the west side. Under the heavy canopy there is little undergrowth, but wherever sunlight can penetrate shrub species may be found. Among these are the shade loving red whortleberry (*Vaccinium parvifolium*), blue whortleberry (*Vaccinium ovalifolium*), and salal (*Gaultheria shallon*). Thick carpets of moss cover rocks and fallen logs.

On the other sides of the park, where precipitation is considerably less, the lower valleys and slopes are also densely covered with Douglas fir, western hemlock, western red cedar, and silver fir (*Abies amabilis*). Bigleaf maple (*Acer macrophyllum*) and red alder (*Alnus rubra*) are common along streams. Undergrowth is not abundant, but in openings may be found the red and blue whortleberries, western thimbleberry (*Rubus parviflorus*) and rusty menziesia (*Menziesia ferruginea*). Alder and willow are common particularly along streams.

At higher elevations the western hemlock, western red cedar, and silver fir are gradually replaced by mountain hemlock (*Tsuga Mertensiana*), Alaska cedar (*Chamaecyparis nootkatensis*), and alpine fir (*Abies lasiocarpa*). Douglas fir continues for some distance into this belt, but Sitka spruce is limited

to the lower elevations. As the forest thins out in the upper areas, the shrubby undercover becomes more important. Common species include Pacific red elder (*Sambucus racemosa* var. *callicarpa*), Rocky Mountain maple (*Acer glabrum*), rusty menziesia (*Menziesia ferruginea*), western thimbleberry (*Rubus parviflorus*), big whortleberry (*Vaccinium membranaceum*), and vine maple (*Acer circinatum*). Brush fields occur where fire or rock slides have cleared the forest but these areas make up only a small fraction of the vegetated area.

Above 4,500 feet elevation the dominant tree species are alpine fir and mountain hemlock which form open park-like stands, often as scattered tree islands dotting open grassland areas. Along with numerous showy-flowered herbaceous plants, many low sub-alpine shrubs are found in these meadows, often covering extensive areas. Some of the more common species include delicious blueberry (*Vaccinium deliciosum*), red mountainheath (*Phyllodoce empetriformis*), white heather (*Cassiope Mertensiana*), subalpine spirea (*Spiraea densiflora*), and various species of willow.

MOUNT RAINIER NATIONAL PARK

Mount Rainier National Park lies on the west side of the Cascade Mountains with the eastern boundary along the crest of the range. The great volcanic peak for which the park was named, has radiating out from its top the largest glacier system in the United States proper. The climate is relatively mild and moist with an average yearly rainfall of from 60 to 100 inches. The altitudinal range is from 1,716 feet along the western boundary to 14,408 feet at the top of Mount Rainier.

Surrounding the peak on all sides is a magnificent forest with Douglas fir (*Pseudotsuga taxifolia*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*) the common species up to about 3,000 feet. In this lowland forest of the Transition Zone there is usually but little shrubby growth under the shade of the dense forest canopy. Rocks and fallen logs are often covered with moss and lichens. In openings various shrubby species may be found, including red whortleberry (*Vaccinium parvifolium*), blue whortleberry (*Vaccinium ovalifolium*), salal (*Gaultheria shallon*), blueberry elder (*Sambucus coerulea*), several species of currant (*Ribes*), vine maple (*Acer circinatum*), and western yew (*Taxus brevifolia*). The broadleaf trees, red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), and bigleaf maple (*Acer macrophyllum*) are occasionally found along streams with various willows and occasionally red-osier dogwood (*Cornus stolonifera*).

As we proceed higher the Transition forest species are gradually replaced by more open stands of mountain hemlock (*Tsuga Mertensiana*), Alaska cedar (*Chamaecyparis nootkatensis*), noble fir (*Abies nobilis*), silver fir (*Abies amabilis*), and western white pine (*Pinus monticola*). In the upper part of this zone alpine fir (*Abies lasiocarpa*) becomes the dominant fir species. Characteristic shrub species include big whortleberry (*Vaccinium membranaceum*), Pacific red elder (*Sambucus racemosa*), Rocky Mountain

maple (*Acer glabrum*), vine maple, rusty menziesia (*Menziesia ferruginea*), western thimbleberry (*Rubus parviflorus*), and several species of gooseberry and currant (*Ribes*).

As in Olympic National Park, there are few brush-covered areas and these occur in openings caused by fire or snow-slides. Shrub species characteristic of these cleared areas are western thimbleberry, trailing blackberry (*Rubus macropetalus*), and myrtle pachistima (*Pachistima myrsinites*). Sitka alder (*Alnus sinuata*) and shrubby willows are common along streams.

At about 5,000 feet the forest opens out into beautiful park-like meadows with scattered clumps of trees, chiefly alpine fir and mountain hemlock. Whitebark pine (*Pinus albicaulis*) is common along the ridges. Common ground cover plants include such shrubby species as red mountainheath (*Phyllodoce empetriformis*), white heather (*Cassiope Mertensiana*), the dwarf delicious blueberry (*Vaccinium deliciosum*), low willows, and numerous colorful herbaceous species.

Some of these species extend up into the Arctic-alpine Zone above the limit of trees. Other plants of this zone include the tiny alpine willows (*Salix cascadensis* and *S. nivalis*) and many species of mosses, grasses, and sedges. While plant growth is not abundant above 7,000 feet, a few dwarfed individuals are found in sheltered places up as far as 10,000 feet on Mount Rainier.

CRATER LAKE NATIONAL PARK

Crater Lake National Park is centered around Crater Lake, a deep blue body of water approximately six miles in diameter lying in an old volcanic crater. The precipitous surrounding walls rise from 600 to 2,000 feet above the level of the water. From Mt. Scott, 8,938 feet, the highest point in the park, the terrain descends to about 3,800 feet in the lower valleys.

The forests of the lower elevations, up to about 5,500 feet, are composed of douglas fir (*Pseudotsuga taxifolia*) along with ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), incense cedar (*Libocedrus decurrens*), and sugar pine (*Pinus Lambertiana*). The last three species named reach their northern limits here, as far as the national parks are concerned. They are characteristic forest trees in the Sierra Nevada of California. Common shrubby species include greenleaf manzanita (*Arctostaphylos patula*), western thimbleberry (*Rubus parviflorus*), Pacific serviceberry (*Amelanchier florida*), snowbrush ceanothus (*Ceanothus velutinus*), and bitter cherry (*Prunus emarginata*). Thinleaf alder (*Alnus tenuifolia*) forms thickets along the lower streams. Bitterbrush (*Purshia tridentata*) is found on the east side of the Cascade Crest. Broadleaf trees such as aspen (*Populus tremuloides*) and black cottonwood (*Populus trichocarpa*) may be found but they are not common.

In the southwest corner of the park, where the elevation drops to 3,800 feet in Redblanket Canyon, there is a small area where species more characteristic of the lower coastal regions are found. Species found here but not elsewhere in the park include western hemlock (*Tsuga heterophylla*), western

yew (*Taxus brevifolia*), bigleaf maple (*Acer macrophyllum*), Pacific dogwood (*Cornus Nuttalli*), madrone (*Arbutus Menziesi*), California hazel (*Corylus rostrata* var. *californica*), redflowering currant (*Ribes sanguineum*), and trailing blackberry (*Rubus macropetalus*).

Above the lower belt lodgepole pine (*Pinus contorta*) and western white pine (*Pinus monticola*) gradually become dominant. Pinemat manzanita (*Arctostaphylos nevadensis*) is a common species forming a shrubby ground cover over considerable areas.

Forests surrounding the crater rim, down to about 6,000 feet, are composed primarily of mountain hemlock (*Tsuga Mertensiana*) and Shasta red fir (*Abies magnifica* var. *shastensis*) with whitebark pine (*Pinus albicaulis*) occurring on exposed ridges. Shrubby species common in this forest belt are Crater Lake currant (*Ribes erythrocarpum*), Pacific red elder (*Sambucus racemosa*), Rocky Mountain maple (*Acer glabrum*), subalpine spiraea (*Spiraea densiflora*), low species of *Vaccinium*, rockspiraea (*Holodiscus*), and pinemat manzanita (*Arctostaphylos nevadensis*). Sitka alder (*Alnus sinuata*) replaces thinleaf alder of the lower elevations along streams and shrubby willows are common.

In only a few places, as along Grayback Ridge and on the open slopes above Sun Creek Valley, do shrub types cover extensive areas. Greenleaf manzanita and snowbrush are common in these areas.

LASSEN VOLCANIC NATIONAL PARK

Lassen Volcanic National Park includes the region surrounding Lassen Peak from its top at 10,453 feet down to about 5,100 feet elevation. Mount Lassen is the southernmost of a series of volcanic cones extending along the Cascade Mountains and is the only recently active volcano in the continental United States. Although there are magnificent forests clothing the lower sides of the peak, most of the higher country is a barren waste due to relatively recent volcanic eruptions.

The forest, up to about 7,500 feet, is mainly in the Canadian Life Zone with Jeffrey pine (*Pinus Jeffreyi*), white fir (*Abies concolor*), and western white pine (*Pinus monticola*) the dominant species in the lower part of the zone and California red fir (*Abies magnifica*) replacing the white fir in the upper part. Lodgepole pine (*Pinus contorta*) is the common species east of the Cascade Crest.

In the forest openings and on open hillsides many shrub species are common. The chaparral type composes about one tenth of the vegetation cover of the park with greenleaf manzanita (*Arctostaphylos patula*) and snowbrush ceanothus (*Ceanothus velutinus*) as the common species. Other common shrubs are currants and gooseberries (*Ribes sp.*), serviceberry (*Amelanchier alnifolia*), bitter cherry (*Prunus emarginata*), squaw carpet ceanothus (*Ceanothus prostratus*), huckleberry oak (*Quercus vaccinifolia*), and California chinquapin (*Castanopsis sempervirens*). Streams are lined with thickets of shrubby willow and alder (*Alnus tenuifolia*). Broadleaf trees do not

cover any extensive areas, but aspen (*Populus tremuloides*) may be found along the lower water courses.

The upper forests of the Hudsonian Life Zone are characterized by fine stands of mountain hemlock (*Tsuga Mertensiana*) with whitebark pine (*Pinus albicaulis*) following the ridges up to nearly 10,000 feet. Characteristic shrub species are pinemat manzanita (*Arctostaphylos nevadensis*), subalpine spiraea (*Spiraea densiflora*), and others.

YOSEMITE NATIONAL PARK

Yosemite National Park, one of the best known of our national parks, is famous for its steep-walled glacier-carved Yosemite Valley. Elevations range from about 13,100 feet on the Sierra Nevada Crest to 2,000 feet at El Portal, the Merced Valley entrance. Precipitation averages 33 inches yearly in the Yosemite Valley at about 4,000 feet elevation.

Because of the great range in elevation, the vegetation cover is quite varied and often complex. Along the western boundary is the lower foothill area covered for the most part with grassland and scattered oak trees, the principal species being interior live oak (*Quercus Wislizeni*) and canyon live oak (*Quercus chrysolepis*). Occasional trees of digger pine (*Pinus sabiniana*) may be seen in this vegetation belt. Other associates are California buckeye (*Aesculus californica*), buckbrush ceanothus (*Ceanothus cuneatus*), yerba santa (*Eriodictyon californicum*), and Mariposa manzanita (*Arctostaphylos mariposa*).

Above the foothill area is a forest belt in which ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus Lambertiana*), white fir (*Abies concolor*), and incense cedar (*Libocedrus decurrens*) are the common tree species, extending up to about 6,500 feet. California black oak (*Quercus Kelloggi*) is common in the valleys. Common shrubby species include greenleaf manzanita (*Arctostaphylos patula*), California chinquapin (*Castanopsis sempervirens*), deerbrush ceanothus (*Ceanothus integerrimus*), and western thimbleberry (*Rubus parviflorus*). The groves of bigtree (*Sequoia gigantea*) are restricted to this forest belt.

In the upper part of this area the forest becomes predominantly Jeffrey pine (*Pinus Jeffreyi*) and California red fir (*Abies magnifica*) and these remain dominant up to about 9,000 feet or higher. Mountain whitethorn ceanothus (*Ceanothus cordulatus*) and huckleberry oak (*Quercus vaccinifolia*) become important shrubby species in this belt. Pinemat manzanita (*Arctostaphylos nevadensis*) and wax currant (*Ribes cereum*) are also common. Much of the forest on the eastern part of the park is composed of lodgepole pine (*Pinus contorta*) which may occur in pure stands or mixed with mountain hemlock (*Tsuga Mertensiana*). On ridges and barren granite slopes whitebark pine (*Pinus albicaulis*) and Sierra juniper (*Juniperus occidentalis*) are characteristic associates. Shrubby plants found at the higher elevations, up to timberline and above include low willows (*Salix*), bush cinquefoil (*Potentilla fruticosa*), white heather (*Cassiope Mertensiana*), and Brewer mountainheath (*Phyllodoce Breweri*).

KINGS CANYON NATIONAL PARK

The Kings Canyon National Park is one of the newest of our western national parks. It lies immediately to the north of Sequoia National Park, the Kings-Kern Divide forming a common boundary between the two. Elevations range from about 4,600 feet at the Kings Canyon entrance to 13,000 feet along the Sierra Crest. Drainage is mostly by way of the Kings River, but a small section of the northern part drains into the South Fork of the San Joaquin River.

Detailed information concerning the forests of the Kings Canyon National Park is limited since no extensive botanical work has been done covering the whole area, but the flora is comparable in most respects to that of Sequoia National Park. Entering the park along the South Fork of the Kings River, one comes into the spectacular steep-walled Kings Canyon, in many ways similar to the Yosemite Valley. The forest is composed primarily of white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus Lambertiana*), and incense cedar (*Libocedrus decurrens*). Along streams may be found bigleaf maple (*Acer macrophyllum*), white alder (*Alnus rhombifolia*), black cottonwood (*Populus trichocarpa*), and willows (*Salix* sp.). Canyon live oak (*Quercus chrysolepis*) and California black oak (*Quercus Kelloggi*) occur on the drier hillsides. Several bigtree groves (*Sequoia gigantea*), including the General Grant Grove, are located in this forest belt. Shrubby associates include mountain whitethorn ceanothus (*Ceanothus cordulatus*), deerbrush ceanothus (*Ceanothus integerrimus*), and western thimbleberry (*Rubus parviflorus*).

Above 7,000 feet the white fir and ponderosa pine are replaced by Shasta red fir (*Abies magnifica* var. *shastensis*) and Jeffrey pine (*Pinus Jeffreyi*), while incense cedar and sugar pine gradually disappear and western white pine (*Pinus monticola*) and lodgepole pine (*Pinus contorta*) become common. Some of the shrub species seen here are greenleaf manzanita (*Arctostaphylos patula*), Yosemite buckthorn (*Rhamnus rubra* var. *yosemitana*), Sierra currant (*Ribes nevadense*), gooseberry currant (*Ribes montigenum*), Sierra gooseberry (*Ribes Roezli*), and Pacific mountain ash (*Sorbus sitchensis*).

At the higher elevations in certain localities are found foxtail pine (*Pinus Balfouriana*) and mountain hemlock (*Tsuga Mertensiana*). Whitebark pine (*Pinus albicaulis*) is common at and just below timberline. Aspen (*Populus tremuloides*) and several species of willow occur along the borders of the upper meadows. Rocky mountain maple (*Acer glabrum*), subalpine spiraea (*Spiraea densiflora*), and wax currant (*Ribes cereum*) are also found. Such species as Brewer mountainheath (*Phyllodoce Breweri*), Labrador tea (*Ledum glandulosum*), and low alpine willows are found in the meadows above timberline.

SEQUOIA NATIONAL PARK

Sequoia National Park is located in the southern part of the Sierra Nevada. The area ranges in elevation from about 1,500 feet along the western boundary near Ash Mountain to 14,501 feet at the top of Mount

Whitney on the Sierra Crest. Although the highest point in the United States proper, Mount Whitney is not a spectacular peak because it is only one of many points along the top of the already high mountain range. Precipitation along the lower borders averages 21 inches annually, while at Giant Forest at 6,360 feet elevation, 38 inches is recorded.

The lower foothill area is for the most part grass-covered with scattered trees and shrubs, principally interior live oak (*Quercus W.slizeni*), canyon live oak (*Quercus chrysolepis*), and occasionally California blue oak (*Quercus Douglasi*). Among the shrub species are birchleaf mountain mahogany (*Cercocarpus betuloides*), buckbrush ceanothus (*Ceanothus cuneatus*), yerba santa (*Eriodictyon californicum*), Kaweah oak (*Quercus Garryana* var. *Breweri*), and greasewood chamise (*Adenostoma fasciculatum*). The latter often forms pure dense stands in burned-over areas.

Above this type is the main forest belt in which ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), sugar pine (*Pinus Lambertiana*), and incense cedar (*Libocedrus decurrens*) are common at the lower elevations and Jeffrey pine (*Pinus Jeffreyi*) and Shasta red fir (*Abies magnifica* var. *shastensis*) is common above. Located also in this forest belt, mostly at elevations between 6,000 and 7,000 feet are some thirty bigtree groves, of which Giant Forest is the largest. White fir and sugar pine are characteristic associates of the bigtree. Common shrub species are greenleaf manzanita (*Arctostaphyloa patula*), mountain whitethorn ceanothus (*Ceanothus cordulatus*), California chinquapin (*Castanopsis sempervirens*), California fremontia (*Fremontia californica*), western thimbleberry (*Rubus parviflorus*), and willows.

At the higher elevations and on the east side of the park in Kern Canyon, the dominant forest species are foxtail pine (*Pinus Balfouriana*), lodgepole pine (*Pinus contorta*), and Shasta red fir. Along the walls of Kern Canyon western juniper (*Juniperus occidentale*) is found, commonly in association with curl-leaf mountain mahogany (*Cercocarpus ledifolius*). Kern ceanothus (*Ceanothus pinetorum*) is a common shrub of this area.

Above timberline, at around 11,000 to 12,000 feet, many showy alpine species are found. Among the shrubby species are the low tufted skyland willow (*Salix petrophila* var. *caespitosa*), and Brewer mountainheath (*Phyllodoce Breweri*).

ROCKY MOUNTAIN REGION

The Rocky Mountain Region may be divided into three provinces as follows: the Northern Province in which Glacier National Park is located, the Middle Province with Yellowstone and Grand Teton National Parks, and the Southern Province in which Rocky Mountain National Park is found. The Continental Divide runs through the region, passing through each except Grand Teton National Park, which lies a little to the southwest.

GLACIER NATIONAL PARK

Glacier National Park is located in northwestern part of Montana, its northern boundary lying along the Canadian border. Elevations range from

about 3,100 feet at Belton on the southwest to 10,438 feet at the top of Mt. Cleveland. Rainfall averages 27 inches at lower elevations on the west side but is slightly less on the east side of the Continental Divide, the yearly rainfall being recorded as 22 inches at Glacier Park Station.

The vegetation cover is interesting and varied. Forests on the east side of the Divide are typical of those of the Rocky Mountain region in general, while in some areas on the west side they are more characteristic of the Pacific Northwest.

In the lower valleys on the west side of the park, such as in McDonald Valley, there are found species similar to those in the lowland forests of Mount Rainier and Olympic National Parks, such as western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and occasionally lowland white fir (*Abies grandis*). Douglas fir (*Pseudotsuga taxifolia*), western larch (*Larix occidentalis*), western white pine (*Pinus monticola*), and Engelmann spruce (*Picea Engelmanni*) are common associates.

Lodgepole pine (*Pinus contorta*) covers extensive areas, forming dense stands at low and middle elevations over much of the park, or in association with alpine fir (*Abies lasiocarpa*) and Engelmann spruce. Shrub species found commonly in openings in the lower forests up to about 4,500 feet or sometimes higher, include the following: serviceberry (*Amelanchier alnifolia*), western thimbleberry (*Rubus parviflorus*), red raspberry (*Rubus idaeus* var. *aculeatissimus*), common snowberry (*Symphoricarpos albus*), shinyleaf spiraea (*Spiraea lucida*), big whortleberry (*Vaccinium membranaceum*), western yew (*Taxus brevifolia*), creeping hollygrape (*Berberis repens*), bearberry (*Arctostaphylos uva-ursi*), red-osier dogwood (*Cornus stolonifera*), bunchberry dogwood (*Cornus canadensis*), mountain maple (*Acer glabrum*), wild rose (*Rosa* species), black chokecherry (*Prunus virginiana* var. *melanocarpa*), prickly currant (*Ribes lacustre*), and creambush rockspiraea (*Holodiscus discolor*).

At higher elevations, up to about 6,000 feet, in addition to many of the above-mentioned species which extend into the higher zone, common shrubs are bearberry honeysuckle (*Lonicera involucrata*), Utah honeysuckle (*Lonicera utahensis*), rusty menziesia (*Menziesia ferruginea*), subalpine spiraea (*Spiraea densiflora*), mountain ash (*Sorbus scopulina*), and black bead elder (*Sambucus melanocarpa*).

Subalpine meadows are dotted with islands of alpine fir and Engelmann spruce. Whitebark pine is common just below timberline on both sides of the Divide, and Alpine larch (*Larix Lyall.*) is found in some places. Shrubby species occurring here and in alpine meadows include red mountainheath (*Phyllodoce empetriformis*), mountain bog kalmia (*Kalmia polifolia* var. *microphylla*), and low alpine willows.

YELLOWSTONE NATIONAL PARK

Yellowstone National Park in northwestern Wyoming is essentially a high plateau which lies mostly between 7,000 and 8,500 feet elevation, although the terrain descends to 5,400 feet in the lower valleys. From the

top of this tableland mountain ranges rise 2,000 to 4,000 feet higher, the highest point in the park being Electric Peak, 11,000 feet. Average yearly rainfall is about 17 inches at Yellowstone Park station at 6,500 feet and 22 inches at Yellowstone Lake which is over a thousand feet higher in elevation.

Lodgepole pine (*Pinus contorta*) makes up nearly three-fourths of the forest cover. At the lower elevations this forest is so dense that there is scarcely any undergrowth. Above this belt alpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea Engelmanni*) become dominant, but lodgepole pine extends also up to timberline. Douglas fir (*Pseudotsuga taxifolia*) occurs in several locations.

The fir-spruce forests are more open and allow for the growth of a number of shrubby species, including the following: rusty menziesia (*Menziesia ferruginea*), mountain common juniper (*Juniperus communis* var. *saxatilis*), bush cinquefoil (*Potentilla fruticosa*), wild currants and gooseberries (*Ribes* species), serviceberry (*Amelanchier alnifolia*), mountain ash (*Sorbus scopulina*), western thimbleberry (*Rubus parviflorus*), black chokecherry (*Prunus virginiana* var. *melanocarpa*), Rocky Mountain maple (*Acer glabrum*), bearberry (*Arctostaphylos uva-ursi*), big whortleberry (*Vaccinium membranaceum*), and wild rose (*Rosa* species).

Along streams thinleaf alder (*Alnus tenuifolia*) and willows are common, often forming thickets. Broadleaf trees found along streams and lake shores or in other moist locations include aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), and narrowleaf cottonwood (*Populus angustifolia*). The aspen forms small pure groves in some places.

An area in the southern part of the park at elevations below 7,500 feet has several species characteristic of the desert areas of the Great Basin, such as big sagebrush (*Artemisia tridentata*), greasewood (*Sarcobatus vermiculatus*), and prickly pear cactus (*Opuntia polycantha*).

Just below timberline the spruce-fir forests open out into wide expanses of sub-alpine meadows with clumps of dwarf trees dotting the grasslands up to the limit of trees at about 10,000 feet. Besides numerous herbaceous species found in the alpine meadows, there are a number of dwarf alpine shrubs such as Mount Washington dryad (*Dryas octopetala*), skyland willow (*Salix petrophila*), mountain bog kalmia (*Kalmia polifolia* var. *microphylla*), and red mountainheath (*Phyllodoce empetriformis*).

GRAND TETON NATIONAL PARK

Grand Teton National Park, located along the eastern face of the Teton Mountain Range, lies only a relatively few miles south of Yellowstone National Park and extends for a length of 27 miles. Cut into the face of this range are many spectacular glaciated canyons separated by ridges and peaks. Drainage is into the Snake River which flows south through the Jackson Hole country and thence to the Pacific Ocean. The Grand Teton, the highest point in the park, 13,766 feet, rises 7,000 feet above the floor of the Jackson Hole basin. Yearly rainfall averages 22 inches at Moran, the north entrance.

The forests are very similar to those of Yellowstone National Park. Lodge-

pole pine (*Pinus contorta*) is common on the flats and moraines up to about 8,000 feet with very little undergrowth. Extensive areas are covered with alpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea Engelmanni*), which extend up to timberline. Whitebark pine (*Pinus albicaulis*) is often an associate, especially in the upper part of the range. Douglas fir (*Pseudotsuga taxifolia*) occurs in many places, generally in association with alpine fir and Engelmann spruce, or sometimes in open stands on rocky southern exposures.

Shrub species characteristic of the fir and spruce forests are very similar to those found in Yellowstone National Park. Among them may be listed myrtle pachistima (*Pachistima myrsinites*), rusty menziesia (*Menziesia ferruginea*), creeping hollygrape (*Mahonia repens*), bearberry honeysuckle (*Lonicera involucrata*), russet buffaloberry (*Shepherdia canadensis*), serviceberry (*Amelanchier alnifolia*), mountain ash (*Sorbus scopulina*), and wild currants and gooseberries (*Ribes* species). In forest openings and on open slopes are found western thimbleberry (*Rubus parviflorus*), snowbrush ceanothus (*Ceanothus velutinus*), black chokecherry (*Prunus virginiana* var. *melanocarpa*), and sagebrush (*Artemisia tridentata* and var. *arbuscula*). Several species of *Salix* are common along streams in valley bottoms and thinleaf alder (*Alnus tenuifolia*) on moist hillsides.

Aspen (*Populus tremuloides*) is abundant at the lower elevations, often forming pure stands in moist locations. Higher up on dry open slopes it is also common, sometimes forming dense thickets. Here, however, it tends to become dwarfed and shrubby. Narrowleaf cottonwood (*Populus angustifolia*) is found occasionally along the eastern boundary and balsam poplar (*Populus balsamifera*) occurs in a few localities.

The trees at high elevations become much dwarfed and scattered, sometimes forming mats or carpets on exposed ridges at timberline. In these subalpine areas characteristic shrub species are subalpine spiraea (*Spiraea densiflora*), Rocky Mountain whortleberry (*Vaccinium oreophilum*), and shrubby willows. Numerous herbaceous species are found here as well as in the alpine meadows above timberline. Low alpine shrubby plants include red mountainheath (*Phyllodoce empetriformis*), skyland willow (*Salix petrophila*), mountain bog Kalmia (*Kalmia polifolia* var. *microphylla*), and Mount Washington dryad (*Dryas octopetala*).

ROCKY MOUNTAIN NATIONAL PARK

Rocky Mountain National Park in north central Colorado is located in the southern province of the Rocky Mountain Region. The park lies along the Continental Divide at relatively high elevations, from about 7,600 feet at the east entrance to 14,255 feet at the top of Long's Peak. Yearly rainfall averages 19 inches at Estes Park on the east side and 16 inches at Grand Lake at about 8,300 feet on the west side. A fine motor highway crosses the Continental Divide at an elevation of over 12,000 feet which affords the traveller an opportunity to observe without undue effort the changes in vegetation in passing through several different Life Zones.

Lodgepole pine (*Pinus contorta*) forms extensive forests at the lower elevations with ponderosa pine (*Pinus ponderosa*) occurring in the valleys. Wax currant (*Ribes cereum*) is a common shrub in this forest while the dry open slopes favor such species as big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), and Parry rabbitbrush (*Chrysothamnus Parryi*). Engelmann spruce (*Picea Engelmanni*) and alpine fir (*Abies lasiocarpa*) predominate in the zone above and on up to timberline. Douglas fir (*Pseudotsuga taxifolia*) is found in scattered patches throughout these types and limber pine (*Pinus flexilis*) is widespread, though not abundant. The only common broadleaf tree is aspen (*Populus tremuloides*), which occurs mainly in the zone above the ponderosa pine. Shrubby willows (*Salix* species) are abundant along streams and in moist valley bottoms.

Shrubs which may be found in the spruce-forest belt include Rocky Mountain maple (*Acer glabrum*), creeping hollygrape (*Berberis repens*), grouse whortleberry (*Vaccinium scoparium*), Rocky Mountain whortleberry (*Vaccinium oreophilum*), and snowberry (*Symphoricarpos albus*). Commonly found in rocky canyons or openings in the forest are such species as cliffbush (*Jamesia americana*), bush rockspiraea (*Holodiscus discolor* var. *dumosa*), and boulder raspberry (*Rubus deliciosus*), and in the open upper part of the forest, mountain common juniper (*Juniperus communis* var. *saxatilis*), and snowbrush ceanothus (*Ceanothus velutinus*).

Extensive areas of the park are covered with alpine meadows above the limit of trees. These are characterized by wide expanses of grasslands dotted with clumps of low willows and bog birch (*Betula glandulosa*). In addition to numerous showy-flowered herbs many depressed flowering shrubs are found, including bush cinquefoil (*Potentilla fruticosa*), Mount Washington dryad (*Dryas octopetala*), mountain bog Kalmia (*Kalmia polifolia* var. *microphylla*), and skyland willow (*Salix petrophila*).

SOUTHWEST REGION

The area designated as the Southwest Region is an extensive high plateau drained by the Colorado River and commonly known as the Colorado Plateau. Variously colored cliffs and canyons carved in soft sedimentary sandstones, limestones, and shales give a distinctive character to this country in which are located four of our western national parks.

MESA VERDE NATIONAL PARK

Mesa Verde National Park in southwestern Colorado lies on a high mesa which rises abruptly 2,000 feet above the valley on the north and slopes gradually southward. Park Point, the highest point in the park at an elevation of 8,575 feet, is at the top of the steep escarpment forming the northern boundary and overlooking the valley. Several streams arising at the northern end cut this tilting tableland into nearly parallel ridges and valleys which reach a depth of 1,000 to 2,000 feet along the southern boundary. Many ruins of Pueblo cliff dwellings are found in the nearly perpendicular canyon walls.

The ridge tops along the southern half of the plateau are covered for the most part with luxuriant stands of almost pure piñon-juniper forest. The species are *Pinus edulis* and *Juniperus utahensis*. Shrubby associates in this forest on the plateau and extending down onto the upper canyon walls include such species as mountain mahogany (*Cercocarpus montanus*), cliffrose (*Cowania Stansburiana*), fendlera (*Fendlera rupicola*), Spanish bayonet (*Yucca baccata*), Gambel oak (*Quercus Gambeli*), and serviceberry (*Amelanchier utahensis*).

The northern end of the plateau has a vegetation cover consisting of almost pure thickets of Rocky Mountain white oak (*Quercus utahensis*) and Gambel oak (*Quercus Gambeli*), interrupted now and then by patches of grassland or sagebrush. In these open areas big sagebrush (*Artemisia tridentata*), other species of *Artemisia,* and species of rabbitbrush (*Chrysothamus*) are common along with herbaceous plants.

Douglas fir (*Pseudotsuga taxifolia*) occurs in a few places in protected spots, particularly at the northern end of the park and ponderosa pine, although comparatively rare, is found in a few spots. Such xerophytic species as greasewood (*Sarcobatus vermiculatus*), shadscale (*Atriplex confertifolia*), fourwing saltbush (*Atriplex canescens*), and Nuttall saltbush (*A. Nuttalli*) are characteristic of the lower canyon bottoms and the escarpment face at the northern end of the park.

Bryce Canyon National Park

Bryce Canyon National Park consists principally of a series of amphitheaters formed in the cliff wall where the Paunsaugunt Plateau breaks off into the Paria Valley to the east. Bryce Canyon is the name given to one of the larger of these amphitheaters. A unique type of erosion of the red and white sandstone has resulted in a series of very ornate and fantastic formations which can support practically no plant growth. In the hot dry amphitheater canyons, which descend to elevations of 1,000 feet below the plateau, the vegetation cover consists mainly of a thin stunted growth of piñon (*Pinus edulis*), Utah juniper (*Juniperus utahensis*), and desert types of shrubs.

On the north end of the plateau, which ranges in elevation from about 7,600 to 9,000 feet and with an average annual rainfall of about 14 inches, the forest cover is composed almost etirely of ponderosa pine (*Pinus ponderosa*). Around park headquarters at about 8,000 feet the pine is mixed with white fir (*Abies concolor*) and Douglas fir (*Pseudotsuga taxifolia*). These gradually replace it until at Rainbow Point (9,091 feet) none is found. Bristlecone pine (*Pinus aristata*) occurs also at Rainbow Point as well as in several places just below the edge of the plateau. Shrubby undergrowth is not abundant in the forests of the plateau but a number of species are found in openings or along the edge of the rims. Characteristic among these are greenleaf manzanita (*Arctostaphylos patula*), mountain mahogany (*Cercocarpus montanus* and *C. ledifolius*), bitterbrush (*Purshia tridentata*), smooth rockspirea (*Holodiscus discolor* var. *glabrescens*), Martin ceanothus (*Ceanothus Martini*), Gambel oak (*Quercus Gambeli*), and big sagebrush (*Artemisia tridentata*).

ZION NATIONAL PARK

Zion National Park includes a considerable area surrounding Zion Canyon which has been cut by the Virgin River into the Markagunt Plateau in southwestern Utah. Elevations range from about 3,700 feet in the valley to about 7,800 feet on the plateau. Precipitation averages about 15 inches annually at the lower elevations.

The canyon is marked by massive sandstone walls, either barren or with a very sparse vegetation cover. Species characteristic of the hot dry talus slopes are scrubby piñons, including both singleleaf piñons (*Pinus monophylla*) and the two-needle piñon (*Pinus edulis*), Utah juniper (*Juniperus utahensis*), and a number of scraggly shrubs. Among these may be found scrub oak (*Quercus undulata*), mesquite (*Prosopis glandulosa*), western locust (*Robinia luxurians*), mountain mahogany (*Cercocarpus montanus*), narrowleaf yucca (*Yucca angustissima*), Spanish bayonet (*Yucca baccata*), skunkbush sumac (*Rhus trilobata*), and rubber rabbitbrush (*C. nauseosus* var. *graveolens*). Also common on dry flats or slopes or along the roadsides are such species as cliffrose (*Cowania Stansburiana*), bitterbrush (*Purshia tridentata*), serviceberry (*Amelanchier alnifolia* and *A. Covillei*), Apacheplume (*Fallugia paradoxa*), and Gambel oak (*Quercus Gambeli*), particularly on north-facing slopes. On some of the lower dry washes, such as Coalpits Wash, may be found such desert species as cottonthorn (*Tetradymia spinosa*), pale desert-thorn (*Lycium pallidum*), blackbrush (*Coleogyne ramosissima*), fourwing saltbush (*Atriplex canescens*), snakeweed (*Gutierrezia sarothrae*), and rabbitbrush (*Chrysothamnus*).

The valley floors, wherever there are permanent streams, are lined with broadleaf trees such as Fremont cottonwood (*Populus Fremonti*), willows (*Salix laevigata* and *S. Gooddingi*), boxelder (*Acer negundo* var. *interior*), desert ash (*Fraxinus velutina* var. *coriacea*), and thickets of sandbar willow (*Salix exigua*). Around springs on the slopes bigtooth maple (*Acer grandidentatum*) is common along with desert ash and boxelder.

On the plateaus ponderosa pine (*Pinus ponderosa*) is the dominant tree over the higher parts to the north and east. Piñon-juniper is also common in certain areas where Rocky Mountain red cedar (*Juniperus scopulorum*) occurs along with Utah juniper and piñon. In openings in the forest may be found shrubby species such as thickets of Rocky Mountain white oak (*Quercus utahensis*) or Gambel oak (*Quercus Gambeli*), serviceberry (*Amelanchier alnifolia*), snowberry (*Symphoricarpos rotundifolius*), blueberry elder (*Sambucus coerulea*), greenleaf manzanita (*Arctostaphylos patula*), mountain mahogany (*Cercocarpus montanus*), big sagebrush (*Artemisia tridentata*), and species of currant (*Ribes*).

GRAND CANYON NATIONAL PARK

Grand Canyon National Park in northwestern Arizona includes within its boundaries a section of the Colorado River 105 miles long together with a portion of the Kaibab Plateau on the north and a section of the Coconino Plateau on the south. The wide chasm, formed by weathering of the walls

of the channel as the Colorado River cuts its way through layers of sandstone, limestone, and shale, is from 4 to 18 miles across and over a mile deep. Precipitation varies with the elevation as does the vegetation cover. The yearly average on the North Rim (8,000 to 9,000 feet) is 27 inches, 17 inches on the South Rim (6,500 to 7,500 feet), and 7 inches in the bottom of the canyon (1,850 to 2,500 feet).

The forest on the South Rim is predominantly piñon-juniper (*Pinus edulis* and *Juniperus utahensis*), but there is some ponderosa pine (*Pinus ponderosa*) to the east and Douglas fir (*Pseudotsuga taxifolia*) occurs in shaded places just below the rim. Because the forests are open, shrubby growth is common and the number of species considerable. A few of the more characteristic shrubs are cliffbush (*Cowania Stansburiana*), Gambel oak (*Quercus Gambeli*), desert serviceberry (*Amelanchier Covillei*), Utah serviceberry (*Amelanchier utahensis*), mountain mahogany (*Cercocarpus montanus* and *C. intricatus*), Apacheplume (*Fallugia paradoxa*), and big sagebrush (*Artemisia tridentata*). Sagebrush often occurs in association with fourwing saltbush (*Atriplex canescens*), green ephedra (*Ephedra viridis*), grasses, and herbaceous plants.

Many of the above-listed species are common also on the canyon walls below the South Rim and down nearly to the Tonto platform. In addition there are many others worthy of note, including fendlera (*Fendlera rupicola*), snowberry (*Symphoricarpos rotundifolius* and *S. longiflorus*), hoptree (*Ptelea Baldwini*), singleleaf ash (*Fraxinus anomala*), mock-orange (*Philadelphus microphyllus*), and Nevada ephedra (*Ephedra nevadensis*). Southwestern fragrant ash (*Fraxinus cuspidata* var. *macropetala*) is very showy during the flowering season along the Bright Angel trail in the redwall limestone formation. It occurs also in the same formation below the North Rim.

The North Rim forest on the Kaibab Plateau is predominantly ponderosa pine along with white fir (*Abies concolor*) and Colorado blue spruce (*Picea pungens*). Aspen is also very common, occurring either in pure groves or intermingled with the conifers. Characteristic shrubs found in openings or along the edges of the forest are western locust (*Robinia luxurians*), mountain common juniper (*Juniperus communis* var. *saxatilis*), and greenleaf manzanita (*Arctostaphylos patula*). Cliffrose is also abundant on some of the open points near the edge of the rim, such as at Cape Royal and Point Sublime.

Below the rim in more or less sheltered or shaded canyons may be found forests of white fir and Douglas fir. Associated with them are often found redbud (*Cercis occidentalis*), bigtooth maple (*Acer grandidentatum*), Rocky Mountain maple (*Acer glabrum*), ceanothus (*Ceanothus Martini*), New Mexican raspberry (*Rubus deliciosus* var. *neomexicanus*), and smooth rockspiraea (*Holodiscus discolor* var. *glabrescens*).

On the Tonto platform may be found a desert type of vegetation, treeless except perhaps for a few small broadleaf trees along streams, and for the most part sparsely covered with low straggly shrubs adapted to withstand severe drought. A few of the many species include blackbrush (*Coleogyne*

ramosissima), ephedra (*Ephedra viridis* and *E. Torreyana*), desert almond (*Prunus fasciculata*) and mescal (*Agave utahensis*). Along the Colorado River and tributaries there occur such species as seepwillow (*Baccharis glutinosa*), Emory baccharis (*B. Emoryi*), arrow-weed (*Pluchea sericea*), and mesquite (*Prosopis glandulosa*) on the slopes above.

GREAT LAKES REGION

ISLE ROYALE NATIONAL PARK

Isle Royale National Park includes within its boundaries a group of islands in northwestern Lake Superior near the Canadian border, our only entirely insular national park. The main island, which is about 45 miles long and 7 miles wide, has adjacent to it many smaller islands. Although lying in the Great Lakes Region, the vegetation has some features in common with the more northern of our western national parks.

The forest cover of Isle Royale is made up principally of balsam (*Abies balsamea*), white spruce (*Picea glauca*), and paper birch (*Betula papyrifera*) with mountain ash (*Sorbus americana*) and pin cherry (*Prunus pennsylvanica*) often found in the understory. The trees are in very dense stands in the flats and hollows which lie between the several long ridges running lengthwise of the island, but considerable underbrush is found in openings or at the edges of the forest. A few of the characteristic shrubby associates are western thimbleberry (*Rubus parviflorus*), red raspberry (*Rubus idaeus* var. *aculeatissimus*), alder (*Alnus crispa* and *A. incana*), several species of serviceberry (*Amelanchier*), and dogwood (*Cornus canadensis* and *C. stolonifera*). Above the Lake Superior shore line at the edge of the forest lowbush blueberry (*Vaccinium angustifolium*) is common and often bearberry (*Arctostaphylos uva-ursi*) or mats of the dwarf juniper (*Juniperus communis* var. *depressa*). Jack pine (*Pinus Banksiana*) is common in places but with very little undercover. Aspen (*Populus tremuloides*) is also frequent.

Moose have had a considerable effect upon the shrubby vegetation in the park. This is particularly evident when one compares records of vegetation found today on the main island with records of the past.[3]

Canada yew (*Taxus canadensis*) was at one time an important shrub over a considerable part of the island. Today it can scarcely be found except on the outlying islands where moose have not been to any great extent. Beaked filbert or hazelnut (*Corylus rostrata*) was also at one time more widespread than it is now since it has been overbrowsed by the moose.

Along the ridges red maple (*Acer rubrum*) is common and patches of red pine (*Pinus resinosa*) frequent. At the southeast end of the island along the flats on top of Greenstone Ridge may be found groves of sugar maple (*Acer saccharum*) and yellow birch (*Betula lenta*). This is a hardwood forest type more typical of those further south.

In the bottoms of the depressions between the ridges are found many

[3] Brown, C. A., Ferns and Flowering Plants of Isle Royale, Michigan, pp. 18-20. 1933.

interior lakes, swamps, or bogs. Thickets of wax myrtle (*Myrica gale*) are frequent along the lake shores and the swamps are usually filled with thick, spongy carpets of sphagnum moss. Characteristic of these bog areas are small trees of black spruce (*Picea Mariana*), white cedar (*Thuja occidentalis*), and eastern larch (*Larix laricina*). A few of the shrubby associates are Labrador tea (*Ledum groenlandicum*), bog Kalmia (*Kalmia polifolia*), downy andromeda (*Andromeda glaucophylla*), leatherleaf (*Chamaedaphne calyculata*), and cranberry (*Vaccinium macrocarpon* and *V. oxycoccus*).

Field Guide to the Trees

I. Trees with leaves linear or scale-like; fruits woody cones or sometimes fleshy and berry-like.

A. TREES WITH LINEAR OR NEEDLE-LIKE LEAVES; FRUITS WOODY CONES.[4] ....PINACEAE.

1. *Leaves flattened-linear, borne singly along the stems, the base not surrounded by a sheath.*

Cones borne erect on the upper branches; twigs with round smooth scars after the leaves fall ....ABIES.

Leaves spreading horizontally on the twigs, at least on lower branches.

Leaves dark green above with two white lines on lower surface, rounded or often notched at tips; northern species, as to the national parks.

Leaves in two series, the longer spreading in two ranks, the shorter pointing forwards and overlaying the others; in Pacific Northwest ....Silver fir (*A. amabilis*).

Leaves about equal in length, spreading opposite each other.

Large trees 80 or more feet high with broad tops; cones green; in the Northwest ....Lowland white fir (*A. grandis*).

Slender trees usually less than 50 feet high; cones purplish; eastern species ....Balsam fir (*A. balsamea*).

Leaves dull green above, two white lines above and below, the tips rounded; found in California parks and the Southwest ....White fir (*A. concolor*).

Leaves curving upwards, thus appearing crowded on upper sides of the branchlets.

Mature trees with more or less rounded tops; cones oval to broadly oblong-cylindric, 4 to 8 inches long.

Cones without conspicuous bracts protruding from between the cone scales; in Lassen and Yosemite National Parks ....California red fir (*A. magnifica*).

Cones with conspicuous tongue-like bracts protruding from between the cone-scales.

Leaves ridged down the middle on both sides, thus somewhat 4-sided; found at Crater Lake, Kings Canyon, and Sequoia National Parks ....Shasta red fir (*A. magnifica* var. *shastensis*).

Leaves flattened and grooved down the middle on the upper side; occurs at Mount Rainier ....Noble fir (*A. nobilis*).

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4 California nutmeg (*Torreya californica*), a tree belonging to the yew family with linear leaves and fleshy fruits, occurs occasionally in some California parks.

Slender trees with spire-like tops; cones oblong-cylindric, 2½ to 4 inches long; in Northwest and Rocky Mountain parks ..... Alpine fir (*A. lasiocarpa*).

Cones spreading or hanging downwards; twigs rough after leaves fall (except Douglas fir).

Leaves prickly-pointed, the foliage often harsh ..... PICEA.

Young branchlets smooth.

Cone-scales mostly angular and somewhat gnawed at the tips; western species.

Leaves flattish in cross-section; occurs in coastal forests of the Northwest ..... Sitka spruce (*P. sitchensis*).

Leaves 4-angled in cross-section; in Rocky Mountains and Southwest ..... Blue spruce (*P. pungens*).

Cone-scales mostly rounded, the margins not toothed; northern species found on Isle Royale ..... White spruce (*P. glauca*).

Young branchlets finely hairy.

Cones oblong-cylindric, the scales rather soft and flexible though resilient; forest tree found in the western parks ..... Engelmann spruce (*P. Engelmanni*).

Cones ovoid, the scales stiff and rigid; northern species found on Isle Royale ..... Black spruce (*P. mariana*).

Leaves not prickly-pointed; foliage soft.

Leaves usually spreading all around the stems; cones with 3-pointed bracts protruding from between the cone-scales; tip of tree erect ..... Douglas fir (*Pseudotsuga taxifolia*).

Leaves spreading horizontally to form flat sprays, those on upper side sometimes shorter; cones without protruding bracts; tip of tree whip-like, nodding ..... TSUGA.

Leaves flat; cones oval to oblong, ¾ to 1 inch long; lower elevations ..... Western hemlock (*T. heterophylla*).

Leaves rounded or ridged below; cones oblong-cylindric, 1 to 3 inches long; higher elevations ..... Mountain hemlock (*T. Mertensiana*).

2. *Leaves needle-like, borne in bundles of 2 or more, or if single, then with a scale-like sheath at the base.*

a. Needles on peg-like branchlets in clusters of 15 to 40; deciduous trees ..... LARIX.

Cones oval to oblong, the scales numerous, shorter than the bracts; in Glacier National Park.

Branchlets smooth or becoming so; leaves triangular in cross-section; trees of lower elevations ..... Western larch (*L. occidentalis*).

Branchlets woolly; leaves 4-angled in cross-section; trees of higher elevations ..... Alpine larch (*L. Lyalli*).

Cones somewhat globose, the scales few, longer than the bracts; leaves triangular in cross-section; on Isle Royale ..... Eastern larch (*L. laricina*).

b. Needles in bundles of 1 to 5; evergreen trees ..... PINUS.

Needles 1 to 3 in a bundle.

Needles 1 to 3 inches long, one or 2 in a bundle; cones egg-shaped to somewhat globose, ¾ to 2 inches long.

Needle 1; seeds large; occurs in Southwest and Sierra Nevada ..... Singleleaf piñon (*P. monophylla*).

Needles 2.

Cones oval to globose; seeds large; occurs in the Southwest ..... Piñon (*P. edulis*).

Cones egg-shaped to globose; seeds small; not found in the Southwest parks.

Needles 1 to 3 inches long; western species ..... Lodgepole pine (*P. contorta*).

Needles less than 2 inches long; eastern species ..... Jack pine (*P. Banksiana*).

Needles 4 to 12 inches long; cones 2 to 10 inches long.

Cones remaining closed and persistent for many years; rare in Yosemite National Park ..... Knobone pine (*P. attenuata*).

Cones opening at maturity and not long persistent.

Trees with trunks branched below; bark dark gray, roughly furrowed; cones with large seeds; lower elevations in Yosemite National Park ..... Digger pine (*P. sabiniana*).

Trees with one main trunk; bark cinnamon or reddish-brown, broken into irregular plates; cones with small seeds.

Needles in 3's (or sometimes 2's), 5 to 10 inches long; cones 3 to 10 inches long; western species.

Bark scales sulphur-yellow on under side; cones 3 to 6 inches long; widespread in western parks ..... Ponderosa pine (*P. ponderosa*).

Bark scales reddish-brown on under side; cones 5 to 10 inches long; in California parks ..... Jeffrey pine (*P. Jeffreyi*).

Needles in 2's, 4 to 6 inches long; cones about 2 inches long; eastern species ..... Red pine (*P. resinosa*).

Needles 5 in a bundle.

Needles 2 to 5 inches long; cones cylindric, long-stalked and pendent from the ends of the branches; trees of mostly lower or middle altitudes.

Needles with conspicuous white lines on back; cones 12 to 18 inches long; in southern Cascades and Sierra Nevada parks ..... Sugar pine (*P. Lambertiana*).

Needles without white lines; cones 4 to 12 inches long.

Needles 2 to 4 inches long; cones 5 to 12 inches long; western species ..... Western white pine (*P. monticola*).

Needles 3 to 5 inches long; cones 4 to 8 inches long; eastern species ..... Eastern white pine (*P. strobus*).

Needles ¾ to 2½ inches long; cones egg-shaped or roundish to oblong, short-stalked and spreading from ends of the branches; high altitude trees.

Cones narrowly egg-shaped to oblong, 2½ to 7 inches long.

Needles 1 to 2½ inches long; cones to 7 inches long, the scales without prickles; Rocky Mountains and in Sequoia National Park ..... Limber pine (*P. flexilis*).

Needles ¾ to 1 inch long; cones to 5 inches long, the scales with minute slender prickles; in Kings Canyon and Sequoia National Parks ..... Foxtail pine (*P. Balfouriana*).

Cones egg-shaped or roundish, 1 to 3½ inches long.

Needles 1 to 2½ inches long; cones broadly egg-shaped to roundish, the scales without prickles; in Pacific slope parks and parks of Montana and Wyoming ..... Whitebark pine (*P. albicaulis*).

Needles 1 to 1½ inches long; cones slender-egg-shaped, the scales with long slender prickles; in Bryce Canyon National Park ..... Bristlecone pine (*P. aristata*).

B. TREES WITH SCALE-LIKE OR AWL-SHAPED LEAVES; FRUITS CONES OR BERRIES.

Leaves awl-shaped, spreading from the twigs ; cones 1½ to about 3½ inches long, the scales much thickened at the tips, not overlapping; in Sierra Nevada parks ..... Bigtree (*Sequoia gigantea*).

Leaves scale-like, closely appressed to the twigs; cones small, woody, or fleshy and berry-like ..... CUPRESSACEAE.

Fruits woody cones, composed of few scales; leafy twigs more or less flattened.

Cones oblong; in southern Cascades and Sierra Nevada parks ..... Incense cedar (*Libocedrus decurrens*).

Cones roundish; in northern parks only.

Cone-scales thinnish, overlapping; trees of middle elevations ..... THUJA.

Large trees 100 to 200 feet high; cones with usually 6 fertile scales; in Northwest ..... Western red cedar (*T. plicata*).

Smaller trees not over 60 feet high; cones with usually 4 fertile scales; eastern species ..... Northern white cedar (*T. occidentalis*).

Cone-scales umbrella-shaped and attached to a central core; trees of higher elevations in the Northwest ..... Alaska cedar (*Chamaecyparis nootkatensis*).

Fruits berry-like, blue with a bloom or becoming reddish; leafy twigs cord-like ..... JUNIPERUS.

Trees found in Sierra Nevada parks, at high elevations ..... Western juniper (*J. occidentalis*).

Trees found in Southwest and Rocky Mountain parks, at middle elevations.

Foliage rather coarse, yellowish-green; common component of piñon-juniper forests of the Southwest ..... Utah juniper (*J. utahensis*).

Foliage finer, dark green; in Southwest and Rocky Mountain parks ..... Rocky Mountain red cedar (*J. scopulorum*).

II. Trees with broad leaves; fruits various.

A. LEAVES NOT LOBED NOR DIVIDED, OR LEAVES PINNATELY LOBED.

1. *Flowers inconspicuous, male and female borne separately; petals none.*

a. Both pollen-bearing and seed-bearing flowers borne in catkins, these sometimes woody and cone-like.

Fruits small 1-celled capsules containing cottony seeds; scales below fruits small and inconspicuous ..... SALICACEAE.

Leaves commonly broad (except narrowleaf cottonwood); scales of catkins lobed ..... POPULUS.

Leaf-stalks flattened at base of blade, the blades broadly egg-shaped to roundish, triangular, or nearly heart-shaped.

Capsules thin, slender-conical.

Leaf-margins toothed to nearly entire; widespread in the parks ..... Quaking aspen (*P. tremuloides*).

Leaf-margins coarsely and irregularly toothed; eastern species ..... Bigtooth aspen (*P. grandidentatum*).

Capsules thickish, narrowly egg-shaped to roundish; in the Southwest.
Fruit-stalks shorter than the capsules; in Zion and Grand Canyon National Parks .....Fremont cottonwood (*P. Fremonti*).
Fruit-stalks 2 to 3 times longer than capsules; in Mesa Verde and Bryce Canyon National Parks .....Valley cottonwood (*P. Wislizeni*).

Leaf-stalks round, the blades usually lance-shaped to narrowly egg-shaped (rarely heart-shaped in balsam poplar).
Leaves lance-shaped, green on both sides; in Rocky Mountains and in Zion and Bryce Canyon National Parks .....Narrowleaf cottonwood (*P. angustifolia*).
Leaves mostly broadly lance-shaped to narrowly egg-shaped, occasionally broader or sometimes heart-shaped, dark green above, whitish below.
Capsules hairy; lower elevations in Pacific slope parks .....Black cottonwood (*P. trichocarpa*).
Capsules smooth; in Rocky Mountains and on Isle Royale .....Balsam poplar (*P. balsamifera*).

Leaves commonly narrow, mostly lance-shaped, sometimes egg-shaped, rarely roundish; scales of catkins not lobed nor toothed .....SALIX.
Scales of catkins yellowish, soon falling; stamens 3 or more, the filaments hairy below; leaves smooth on both sides.
Leaves green on both sides, mostly lance-shaped; stamens 3 to 5 .....Narrowleaf black willow (*S. Gooddingi*).
Leaves pale or whitish below, lance-shaped to egg-shaped.
Leaf-stalks glandular; widespread in the parks .....Western black willow (*S. lasiandra* and vars.).
Leaf-stalks not glandular; in Yosemite and Zion National Parks .....Red willow (*S. laevigata*).
Scales of catkins dark brown, persistent; stamens 2, the filaments smooth; leaves dark green above, whitish and hairy below.
Leaves mostly lance-shaped; filaments mostly united below; capsules smooth .....Arroyo willow (*S. lasiolepis*).
Leaves elliptic with somewhat broader tips; filaments distinct; capsules finely hairy; widespread in the western parks .....Fire willow (*S. Scouleriana*).

Fruits small more or less winged nutlets, the scales forming small cones .....BETULACEAE.
Cones somewhat woody, borne in clusters of several, not falling to pieces on tree; Pacific species .....ALNUS.
Leaves rather coarsely toothed, the margins inrolled; older bark whitish or grayish; in the Northwest .....Red alder (*A. rubra*).
Leaves finely toothed, the margins flat; older bark brown and scaly; in Sierra Nevada .....White alder (*A. rhombifolia*).
Cones composed of papery scales, borne singly, falling to pieces on tree; found mostly east of Pacific slope .....BETULA.
Cones cylindric, spreading or pendent on slender stalks; wing broader than the seed-like nutlet.
Bark whitish, separating into thin layers; northern species .....Paper birch (*B. papyrifera*).
Bark reddish-brown, not separating into layers; widespread species .....Red birch (*B. fontinalis*).
Cones oblong-egg-shaped, borne erect without stalks; wing not broader than the seed-like nutlet; eastern species.

Leaves heart-shaped at base; scales of catkins smooth; bark dark brown ..... Sweet birch (*B. lenta*).

Leaves mostly wedge-shaped at base; scales of catkins hairy; bark yellow or whitish ..... Yellow birch (*B. lutea*).

b. Pollen-bearing flowers borne in catkins; seed-bearing flowers in tiny clusters, at first.

Leaves broadly to narrowly egg-shaped, the margins finely toothed; fruits not acorns.

Leaves light green; fruits enclosed in bladdery sacs borne in small clusters ..... Western hophornbeam (*Ostrya Knowltoni*).

Leaves dark green; fruits dryish berries ..... Hackberry (*Celtis Douglasi*).

Leaves mostly oblong to elliptic, deeply lobed to not lobed, the margins toothed or not toothed; fruits acorns ..... QUERCUS.

Leaves ¾ to 3 inches long, mostly not lobed, sometimes toothed.

Deciduous trees; leaves not toothed, sometimes shallowly lobed; in Sequoia National Park ..... California blue oak (*Q. Douglasi*).

Evergreen trees; leaves with smooth or spine-toothed margins; in Sierra Nevada parks.

Leaves green and smooth on both sides ..... Interior live oak (*Q. Wislizeni*).

Leaves yellowish-fuzzy below ..... Canyon live oak (*Q. chrysolepis*).

Leaves 2 to 8 inches long, conspicuously lobed.

Lobes rounded; in Southwest ..... Rocky Mountain white oak (*Q. utahensis*).

Lobes pointed, bristle-tipped; not in Southwest.

Leaves 2 to 4 inches long, not toothed; semi-evergreen ..... Evergreen black oak (*Q. morehus*).

Leaves 4 to 8 inches long, the lobes with few coarse teeth; deciduous trees.

Leaves lustrous green above; scales of acorn-cup rather loosely imbricated; western species ..... California black oak (*Q. Kelloggi*).

Leaves usually dull on upper surface; scales of acorn-cup closely appressed; eastern species ..... Red oak (*Q. borealis*).

2. *Flowers showy, male and female parts borne together in same flower; petals present or with petal-like sepals or bracts.*

Leaves alternate.

Deciduous trees; leaves with margins toothed; fruits small apples; in Northwest parks ..... Oregon crabapple (*Malus fusca*).

Evergreen trees; leaves not toothed; fruits not apples; not in Northwest.

Leaves oblong to lance-shaped, 3½ to 4½ inches long; flowers with petal-like sepals, yellow, borne in small clusters; fruits olive-like ..... Oregon myrtle (*Umbellularia californica*).

Leaves narrowly elliptic to egg-shaped, 3 to 6 inches long; flowers white, bell-shaped, borne in showy clusters at the ends of the branches; fruits red berries ..... Madrono (*Arbutus Menziesi*).

Leaves opposite; flower-clusters surrounded by 4 white petal-like bracts; fruits red berries, borne in heads ..... Pacific dogwood (*Cornus Nuttalli*).

B. LEAVES PALMATELY LOBED, OR LEAVES DIVIDED INTO SEPARATE LEAFLETS.

1. *Leaves palmately lobed or divided.*

Leaves large and coarse, 5 to 11 inches across; fruits not winged; Sierra Nevada parks.

Leaves alternate, the blades deeply lobed; flowers and fruits borne in dense round balls on slender stems ....California sycamore (*Platanus racemosa*).

Leaves opposite, divided into separate leaflets; flowers white, borne in showy erect clusters; fruits resembling chestnuts .....California buckeye (*Aesculus californica*).

Leaves mostly smaller, not so coarse; fruits double-winged; widespread in the parks .....ACER.

Leaves 5-lobed, the notches between the lobes rounded, coarsely few-toothed.

Flowers borne in oblong clusters, the fruits hairy; in Pacific slope parks .....Bigleaf maple (*A. macrophyllum*).

Flowers borne in umbel-like clusters, the fruits smooth.

Leaf-blades usually hairy below; in Southwest parks .....Bigtooth maple (*A. grandidentatum*).

Leaf-blades mostly smooth below; eastern species .....Sugar maple (*A. saccharum*).

Leaves 3- or 5-lobed, the notches V-shaped, finely to coarsely toothed; eastern species .....Red maple (*A. rubrum*).

2. *Leaves pinnately divided into separate leaflets.*

Fruits double-winged; leaflets 3 to 5 .....Boxelder (*Acer negundo* var. *interius*).
Fruits single-winged; leaflets 3 to 11 .....FRAXINUS.

Leaflets 3 to 7; flowers with a calyx.

Wing of fruit extending down sides of body to below middle; western species .....Desert ash (*F. velutina* var. *coriaceae*).

Wing of fruit scarcely at all extending down sides of body; eastern species .....White ash (*F. americana*).

Leaflets 5 to 11; flowers without calyx; wing of fruit extending to base of body; eastern species .....Black ash (*F. nigra*).

Field Guide to the Shrubs

Leaves large, mostly more than 6 inches long, borne in dense clusters at the base of the plant .....A, p. 24.

Leaves not as above, mostly borne along the stems.

Leaves scale-like, awl-shaped, linear, or apparently none, never in a basal cluster .....B, p. 25.

Leaves mostly broad, not scale-like, awl-shaped, nor linear, sometimes clustered at the base, but then smaller than 6 inches.

Leaves alternate .....C, p. 25.

Leaves opposite or whorled .....D, p. 28.

A. LEAVES BORNE IN A BASAL CLUSTER, ½ TO 4 FEET LONG, LINEAR TO LANCE-SHAPED WITH STIFF SHARP POINTS, STIFF AND LEATHERY OR HARD AND FLESHY.

Leaves tough and leathery or fleshy, the margins fringed with tough stringy fibers; flowers white or streaked with purple .....YUCCA, p. 34.

Leaves thick and fleshy, the margins armed with stiff spine-tipped teeth; flowers yellow .....AGAVE, p. 37.

B. SHRUBS WITH LEAVES SCALE-LIKE, AWL-SHAPED, OR LINEAR, OR LEAVES APPARENTLY NONE.

Flowers borne singly or in clusters, not in heads.
Flowers without petals, or the petals or petal-like sepals distinct.
Fruits fleshy.
Branchlets not spine-tipped; fruits berry-like.
Berries blue with a bloom, resinous; leaves awl-like and sharp-pointed, or scale-like ..... JUNIPERUS, p. 30.
Berries black or red, without a bloom, not resinous; leaves linear.
Shrubs 1 to 12 feet high, or sometimes trees; leaves ½ inch or more long; berries red ..... TAXUS. p. 29.
Low clinging shrubs forming mats; leaves scarcely ¼ inch long; berries black ..... EMPETRACEAE, p. 204.
Branchlets spine-tipped; fruits like tiny peaches ..... *Prunus fasciculata*, p. 128.
Fruits dry capsules or seed-like achenes.
Fruits seed-like achenes, sometimes winged; flowers not red.
Stems apparently leafless; flowers and fruits borne in small scaly cone-like structures ..... EPHEDRA, p. 32.
Stems leafy; flowers not in cone-like structures.
Leaves mostly somewhat fleshy, often mealy; fruits often winged ..... CHENOPODIACEAE, p. 75.
Leaves mostly somewhat leathery; fruits often tailed ..... ROSACEAE, p. 98.
Fruits tiny capsules; flowers red or red-purple.
Flowers tiny, borne in large spreading clusters ..... TAMARICACEAE, p. 174.
Flowers about ½ inch across, one to several ..... KRAMERIA, p. 145.
Flowers with corollas bell-shaped or tubular.
Stems not spiny; fruits capsules.
Leaves green on both sides, scale-like or linear; flowers bell-shaped ..... ERICACEAE, p. 180.
Leaves white-woolly below, linear due to inrolled margins; flowers tubular ..... ERIODICTYON, p. 206.
Stems spiny; fruits berries ..... SOLANACEAE, p. 208.
Flowers borne in flower-like heads surrounded by an involucre of scale-like bracts; fruits seed-like achenes ..... COMPOSITAE, p. 228.

C. LEAVES ALTERNATE, NOT SCALE-LIKE, AWL-SHAPED, NOR LINEAR.

1. *Leaves simple, often toothed but not lobed nor divided into leaflets.*

a. Shrubs not spiny nor prickly.

Flowers of two kinds, pollen-bearing and seed-producing, borne separately and at least the pollen-bearing borne in catkins.
Seed-bearing and pollen-bearing flowers both borne in catkins, these sometimes woody or cone-like.
Fruits small 1-celled capsules with cottony seeds; scales below fruits small and inconspicuous ..... SALICACEAE, p. 37.
Fruits tiny nutlets borne in the axils of enlarged bracts forming small cone-like structures.

Leaves oblong to reverse-lance-shaped, with aromatic odor ..... MYRICA, p. 66.

Leaves egg-shaped to roundish or reverse egg-shaped, without aromatic odor ..... BETULACEAE, p. 55.

Seed-bearing flowers not in catkins.

Fruits hard-shelled nuts surrounded by tube-like involucre or small nutlets enclosed in bladdery sacs ..... BETULACEAE, p. 55.

Fruits acorns or small nutlets enclosed in chestnut-like burs .... FAGACEAE, p. 61.

Flowers mostly of one kind, not borne in catkins.

Flowers inconspicuous, the petals tiny or lacking.

Fruits dry capsules or seed-like achenes.

Calyx not tube-like; fruits capsules or the achenes surrounded by enlarged sepals or bracts.

Leaves mostly somewhat fleshy, often scurfy; fruits seed-like achenes surrounded by enlarged, variously modified bracts or sepals ..... CHENOPODIACEAE, p. 75.

Leaves not fleshy, sometimes thickish; fruits 3- or 5-lobed capsules.

Plants 2 to 4 feet high; leaves up to 1½ inches long; capsules 3-lobed, not glandular ..... BERNARDIA, p. 150

Plants ½ to 1 foot high; leaves up to ½ inch long; capsules 5-lobed, dark-glandular ..... AYENIA, p. 173.

Calyx tubular; fruits seed-like achenes tipped by long feathery tails ..... CERCOCARPUS, p. 137.

Fruits fleshy, berry-like.

Herbage conspicuously silvery ..... ELEAGNUS, p. 176.

Herbage green.

Leaves egg-shaped, 1-sided at the base; fruits becoming brownish-orange; mostly trees ..... CELTIS, p. 67.

Leaves oblong to egg-shaped; berries black or red ..... RHAMNUS, p. 161.

Flowers showy.

Corollas of distinct petals.

Flowers irregular or the petals 4; fruits long 2-valved pods.

Tall deciduous shrubs; flowers red, somewhat pea-like, appearing before the leaves; leaves round, heart-shaped at the base; pods strongly flattened ..... CERCIS, p. 144.

Bushy evergreen shrubs 2 to 4 feet high; flowers yellow, regular, the petals 4; leaves oblong to linear-lance-shaped; pods not flattened ..... DENDROMECON, p. 80.

Flowers regular, the petals 5, white, pink, blue, or reddish; fruits various, if capsules, not linear.

Fruits many-seeded capsules; flowers white or copper-red ..... ERICACEAE, p. 180.

Fruits various, if capsules, 1-seeded or the cells 1-seeded.

Flowers white or pink, the petals plane; fruits small cherries, apples, berries, or tiny 1-seeded pods ..... ROSACEAE, p. 98.

Flowers white or blue, the petals cupped; fruits 3-lobed, clove-like capsules ..... CEANOTHUS, p. 165.

Corollas or corolla-like calyx bell-shaped or tubular.

Flowers not borne in heads surrounded by involucral bracts.

Leaves more or less woolly or felty at least below.

Flowers small, without corollas but the calyx yellow, white, or reddish; fruits small seed-like achenes ..... ERIOGONUM, p. 68.

Flowers 1/3 to 5/8 inch long, blue to purple; fruits small capsules ..... ERIODICTYON, p. 206.

Leaves green, not at all woolly, sometimes hairy, small.

Corollas broadly bell-shaped to urn-shaped, white or pink; fruits small capsules or berries ..... ERICACEAE, p. 180.

Corollas funnel-shaped, 1 to 2 inches long, pink; fruits long-linear capsules 4 to 8 inches long ..... CHILOPSIS, p. 213.

Flowers borne in flower-like heads surrounded below by one or several series of scale-like bracts, with or without petal-like outer ray flowers ..... COMPOSITAE, p. 228.

b. Stems spiny or prickly or the branches spine-tipped.

Shrubs or small trees with stout thorns borne along the stems; leaves coarsely and irregularly toothed or somewhat lobed; fruits dark purple, apple-like berries ..... CRATAEGUS, p. 118.

Shrubs often intricately branched with some of the branches spine-tipped; leaves not toothed or finely toothed; fruits berries or capsules.

Flowers tiny; petals 5 or none; fruits berry-like or clove-like capsules ..... RHAMNACEAE, p. 161.

Flowers 1/2 to 3/4 inch long, tubular; fruits juicy berries ..... SOLANACEAE, p. 208.

2. *Leaves lobed or divided into separate leaflets.*

a. Shrubs spiny or prickly.

Leaves large and coarse, often 12 inches across, palmately lobed; stems and leaf-stalks densely prickly with stiff spines; flowers and fruits in erect clusters; in northern parks ..... OPLOPANAX, p. 174.

Leaves 1/2 to 4 inches across, lobed or divided into several leaflets.

Fruits fleshy; flowers regular, not in heads.

Flowers with calyx saucer-shaped to tubular, white to purplish, the petals tiny; stamens 5; fruits gooseberries or currants ..... RIBES, p. 84.

Flowers with herbaceous calyx, the petals mostly conspicuous; stamens 10 to numerous; fruits berries or apples ..... ROSACEAE, p. 98.

Fruits dry pods or borne in bur-like heads; flowers pea-like or tiny and borne in small heads or dense cylindrical spikes.

Mostly tall shrubs with thorns along the stems; flowers of one kind, pea-like or borne in cylindrical spikes, pink or yellow; fruits pea-like pods ..... LEGUMINOSAE, p. 144.

Low shrubs with some of the branches spine-tipped; flowers in small heads of two kinds; fruits tiny seed-like achenes borne in small bur-like heads ..... FRANSERIA, p. 249.

b. Shrubs not spiny nor prickly.

Flowers borne separately, not in flower-like heads.

Leaves pinnately lobed or divided into spine-toothed leaflets.

Mostly tall shrubs; leaves lobed; flowers inconspicuous, the pollen-bearing borne in long slender catkins; fruits acorns ..... QUERCUS, p. 62.

Mostly low shrubs; leaves divided into spine-toothed leaflets; flowers yellow, all alike; fruits berries ..... BERBERIDACEAE, p. 70.

Leaves palmately lobed, or leaves divided into separate leaflets, not spine-toothed.
Low or tall shrubs, not climbing vines.
Flowers with stamens 5 to 10.
Fruits dry pods or seed-like and winged.
Leaves divided into separate leaflets; flowers not more than 1 inch across.
Flowers blue, purple, or yellow; fruits pea-like pods; herbage without strong odor ..... LEGUMINOSAE, p. 144.
Flowers greenish; fruits seed-like, winged all around; herbage ill-smelling ..... PTELEA, p. 152.
Leaves palmately lobed; flowers 1½ to 2 inches across; fruits felty capsules ..... FREMONTIA, p. 173.
Fruits fleshy.
Calyx corolla-like, saucer-shaped to tubular, borne above ovary; fruits juicy berries ..... RIBES, p. 84.
Calyx green, 5-parted, borne below the other flower parts; fruits dryish berries ..... ANACARDIACEAE, p. 153.
Flowers with stamens many ..... ROSACEAE, p. 98.
Woody vines climbing by tendrils ..... VITACEAE, p. 171.
Flowers borne in flower-like heads surrounded by an involucre of scale-like or herbaceous bracts; fruits small seed-like achenes ..... COMPOSITAE, p. 228.

D. LEAVES MOSTLY OPPOSITE OR WHORLED, NOT SCALE-LIKE, AWL-SHAPED, NOR LINEAR.

1. *Leaves not lobed nor divided, the margins often toothed.*

a. Flowers with separate petals or petal-like bracts, or petals none.
Flowers greenish, yellow, or dark red.
Petals 1 or 2, or none.
Herbage green, smooth, not hairy; fruits wingd or like tiny olives ..... OLEACEAE, p. 204.
Herbage silvery-gray, whitish, or rusty; fruits berries.
Berries silvery, borne in stiff drooping clusters near the ends of the branches ..... GARRYACEAE, p. 177.
Berries red or yellowish, smooth or scurfy, borne singly or several in leaf-axils ..... ELEAGNACEAE, p. 175.
Petals or petal-like bracts 4 or 5 or more.
Much-branched shrubs; flowers dark red; fruits capsules.
Tall shrubs with leaves up to 6 inches long; flowers composed of numerous colored bracts, sepals, and petals; in California parks ..... CALYCANTHACEAE, p. 79.
Low shrubs with leaves seldom more than 1 inch long; flowers with 4 petals, scarcely ¼ inch across; widespread in the parks ..... PACHISTIMA, p. 156.
Straggling shrubs with very slender stems; flowers yellow; fruits seed-like, winged ..... JANUSIA, p. 161.
Flowers white, blue or pink.
Stems 4-angled; leaves in circles of 4; fruits resembling paired seeds, white-hairy ..... GALIUM, p. 213.

Stems not 4-angled; leaves opposite.
Fruits small capsules.
Capsules oblong; petals plane, 4 or 5 ..... HYDRANGEACEAE, p. 81.
Capsules rounded, clove-like; petals 5, the limbs cupped ..... CEANOTHUS, p. 165.
Fruits berry-like, red, white, or bluish ..... CORNACEAE, p. 178.

b. Corollas saucer-shaped, bell-shaped, or tubular.

Herbage with mint-like odor; stems 4-angled.
Flowers blue or purplish, ¼ to ¾ inch long ..... MENTHACEAE, p. 208.
Flowers white, tiny ..... LIPPIA, p. 207.
Herbage without mint-like odor; stems round.
Corollas saucer-shaped, red ..... KALMIA, p. 184.
Corollas bell-shaped to tubular, not red.
Fruits many-seeded capsules; corollas 2-lipped.
Corollas distinctly 2-lipped; ovary borne inside the corolla and free from it ..... SCROPHULARIACEAE, p. 210.
Corollas somewhat 2-lipped; ovary borne below flower parts; eastern genus ..... DIERVILLA, p. 223.
Fruits berries; corollas 2-lipped or not ..... CAPRIFOLIACEAE, p. 214.

2. *Leaves lobed or divided into separate leaflets.*

Fruits winged or with long tails.
Climbing or trailing vines; flowers showy because of conspicuous bracts; fruits long-tailed seed-like achenes ..... CLEMATIS, p. 77.
Erect shrubs or small trees; flowers inconspicuous (showy in 2 species of Fraxinus); fruits seed-like, winged.
Leaves mostly 3- to 11-lobed; fruits double-winged ..... ACERACEAE, p. 157.
Leaves divided into 3 to 5 leaflets; fruits single-winged ..... FRAXINUS, p. 204.
Fruits capsules or berries, not winged nor tailed.
Herbage resinous, with a strong odor of creosote; leaves 2-parted; flowers yellow; fruits small white-hairy capsules ..... LARREA, p. 151.
Herbage not resinous; leaves lobed, or divided into 3 or more leaflets; flowers white or pinkish; fruits smooth.
Leaflets 3; fruits bladder-like capsules, 3-celled; in Sequoia National Park ..... STAPHYLEA, p. 157.
Leaflets 5 to 9 or leaves lobed; fruits berries; widespread in the parks ..... CAPRIFOLIACEAE, p. 214.

YEW FAMILY (Taxaceae)

YEW (*Taxus* L.)

FIELD GUIDE TO THE SPECIES

Mostly tall shrubs or small trees; seeds oval; western species ..... 1. *T. brevifolia.*
Low shrubs; seeds broader than long; eastern species ..... 2. *T. canadensis.*

1. WESTERN YEW (*Taxus brevifolia* Nutt.), fig. 2.—Spreading shrub 1 to 12 feet high or a tree to 30 feet high; bark of old stems reddish-brown,

smooth or becoming shreddy; leaves ½ to ¾ inch long, linear, pointed at the tips, dark green and shiny above, spreading in two ranks so as to form flat sprays; fruit a juicy red berry in the form of a fleshy cup surrounding a single smooth straw-colored seed. The fine, close-grained wood is very hard and durable, yet flexible. It was used by the Indians for their bows.

Fig. 2. Western yew (*Taxus brevifolia*).

Western yew is principally a northern species, found usually along streams or in cool shady canyons. It attains tree size in the humid northwest in Olympic National Park.

Occurrence.—OLYMPIC, common along streams: above Olympic Hot Springs; Lake Crescent. MOUNT RAINIER, common up to 3,500 feet: north Puyallup River road; near Ohanapecosh Hot Springs; Nisqually Valley. CRATER LAKE, rare: Redblanket Canyon, in southwest corner of park. GLACIER, common on the west side, 3,100 to 5,000 feet: Lake McDonald; Sperry trail; St. Mary Lake; upper Waterton valley along trail to Fifty Mountain Camp.

2. CANADA YEW (*Taxus canadensis* Marsh).—Low shrub with straggly spreading stems; leaves and fruits similar to western yew except for the seed which is broader than long. Yew was very abundant on Isle Royale until it became badly overbrowsed by the moose.

Occurrence.—ISLE ROYALE, abundant on outlying islands where moose have not been in any considerable numbers: Moit Island; Smithwick Island; Wright Island; Passage Island.

CYPRESS FAMILY (Cupressaceae)

JUNIPER, CEDAR (*Juniperus* L.)

FIELD GUIDE TO THE SPECIES

Leaves very short and scale-like, appressed to the branches; occurs in northern Rocky Mountains ..... 1. *J. horizontalis.*

Leaves ½ to ¾ inch long, awl-shaped, spreading; widespread in the parks ..... 2. *J. communis.*

1. CREEPING CEDAR (*Juniperus horizontalis* Moench.).— Low evergreen creeping shrub with spreading prostrate stems sometimes 15 feet long; leaves small, scale-like, overlapping and appressed to the cord-like branches; berries round, about ¼ to ½ inch in diameter, dark blue when ripe, coated with a whitish bloom, 1- to 3-seeded.

This species forms dense carpets on rocks and flats where it is found,

but is so low that it may be easily overlooked. The herbage is browsed to a certain extent by deer and the fruits furnish winter food for birds and small mammals.

Occurrence.—GLACIER, occasional on the east side, 4,500 to 5,500 feet: East Glacier Campground; lower end of St. Mary Lake, covering flats near St. Mary checking station; near Cut Bank Chalet; side of Bear Hat Mountain above Hidden Creek. ISLE ROYALE, common on rocky exposures: Mott Island.

2. COMMON JUNIPER (*Juniperus communis* L.).—Common juniper is widely distributed in the northern hemisphere. It differs from other species of juniper in having sharp-pointed awl-shaped leaves spreading from the branchlets instead of the small appressed scale-like leaves. The berries are eaten by birds and small mammals. Common juniper is represented in the national parks by two shrubby varieties.

FIELD GUIDE TO THE VARIETIES

Depressed spreading or prostrate shrubs ½ to 1 (or 3) feet high; leaves ¼ to ⅜ inch long, curved and somewhat appressed; found in the western parks .....2a. Var. *saxatilis*.

Spreading shrub 1 to 3½ feet high, forming large dense mats; leaves 1/3 to ½ inch long, straight or nearly so; found on Isle Royale .....2b. Var. *depressa*.

2a. MOUNTAIN COMMON JUNIPER (Var. *saxatilis* Pall.), fig. 3.—Spreading or prostrate shrub up to 3 feet high, forming broad clumps often several feet in diameter; leaves ¼ to ⅜ inch long, rigid, awl-shaped, sharp-pointed, dark green with a chalky white line, surrounding the stems in circles of 3 and somewhat curved towards the stem; berries dark blue with a bloom. (Syns. Var. *montana* Ait., *J. sibirica* Burgsd.)[5]

Fig. 3. Mountain common juniper (*Juniperus communis* var. *saxatilis*)

Occurrence.—OLYMP.C: Mount Claywood, 6,800 feet. MOUNT RAINIER, occasional, up to 7,500 feet: Plummer Peak; near Longmire. LASSEN. YOSEMITE, rare, in northern and northeastern part of park, 9,500 to 11,500 feet: ridge between Red Peak and Spiller Lake; southeast of Price Peak. GLACIER, common, 3,100 to 7,500 feet: Belton; trail to Mount Brown lookout; Swiftcurrent Peak; Grinnell Point; Mount Altyn; St. Mary Lake; Atlantic Creek trail to Triple Divide Peak; Cut Bank Valley; Two Medicine Valley. YELLOWSTONE: Sylvan Pass; West Thumb; Lonestar Geyser. GRAND TETON, occasional, 6,500 to 8,000 feet: north side of Waterfall Canyon; east of Eagle Rest; near Moose, east of park boundary. ROCKY MOUNTAIN. MESA VERDE: Cliff Palace, 6,800 feet; Springhouse, 7,000 feet. BRYCE CANYON, common on the plateau: south of Inspiration Point along Rim Drive; Rainbow Point. ZION: Mirror

5 See Rehder, Alfred, Manual of cultivated trees and shrubs hardy in North America, second edition, revised and enlarged, p. 62. 1940.

Lake, 8,200 feet. GRAND CANYON, common in open exposed locations on the North Rim: Kaibab Forest.

2b. OLDFIELD COMMON JUNIPER (Var. *depressa* Pursh).—Similar to mountain common juniper but in general somewhat larger, the leaves straight or nearly so and slightly longer, up to about ½ inch long.

Occurrence.—ISLE ROYALE, common: Mott Island.

EPHEDRA FAMILY (Gnetaceae)

EPHEDRA, JOINT-FIR, MORMON-TEA (*Ephedra*, L.).—There are several species of Ephedra found in the desert regions of the Southwest. All are yellowish-green shrubs with broom-like, apparently leafless branches and conspicuously jointed stems, hence the common name joint-fir. The leaves are reduced to small scales forming a sheath at each joint. Flowers and seed-like fruits are borne in small, inconspicuous, greenish, cone-like structures. The Indians of the region prepared a beverage from the dried twigs. A similar drink was used also by the early Mormons in southern Utah and since then the plants have been commonly known as Mormon tea. The seeds were sometimes roasted and ground into flour to make a bitter bread. Locally the plants were reputed to be of medicinal value in the treatment of kidney infections and venereal diseases. The American species of ephedra have attracted the attention of chemists as a possible source of the valuable drug, ephedrin, an alkaloid obtained from a Chinese species of ephedra. So far the results have been negative.[6]

Fig. 4. Green ephedra (*Ephedra viridis*).

FIELD GUIDE TO THE SPECIES

Branches rather stiff, usually in pairs.
Stems yellow-green, the branches numerous, pointing upwards and broom-like .... 1. *E. viridis*.

6 Range Plant Handbook, B 73 (leaf 2): United States Department of Agriculture, Forest Service. 1937.

Stems olive-green, the branches spreading ..... 2. *E. nevadensis.*
Branches flexuous, in pairs or in 3's.
Branches and leaf-scales in 3's; in Zion and Grand Canyon National Parks
..... 3. *E. Torreyana.*
Branches and leaf-scales in pairs; in Mesa Verde National Park .....
..... 4. *E. antisyphilitica.*

1. GREEN EPHEDRA (*Ephedra viridis* Cov.), fig. 4.—Erect shrubs 1½ to 3 feet high, the branches bright yellowish-green, stoutish, appearing leafless, borne in erect broom-like clusters; pollen-bearing and seed-bearing flowers borne on separate plants, in scaly cone-like structures, these borne in pairs at the stem-joints.

Occurrence.—ZION: Coalpits Wash, 4,000 feet. GRAND CANYON, common, 4,000 to 8,000 feet. North Rim: Bright Angel Point; Cape Royal. South Rim: along rim drives; rim trail between Yavapai and Yaki Points. Canyon: Bright Angel trail; Kaibab trail below both rims; Hermit trail.

Fig. 5. Nevada ephedra (*Ephedra nevadensis*).

2. NEVADA EPHEDRA (*Ephedra nevadensis* Wats.),[7] fig. 5.—Erect olive-green or bluish-green shrubs ½ to 2 feet high, the branches somewhat spreading in open brush-like sprays; flowers borne in scaly cone-like structures, the pollen-bearing and seed-bearing on different plants, these borne in pairs at the stem-joints.

Occurrence.—ZION: in the Upper Sonoran Zone. GRAND CANYON, common in the canyon, 2,500 to 4,000 feet: Kaibab trail below Tonto on both sides of Colorado River; near Roaring Springs; Bright Angel trail below Indian Gardens.

3. TORREY EPHEDRA (*Ephedra Torreyana* Wats.).—Erect or spreading shrubs 1 to 3½ feet high, the branches usually flexuous; leaf-scales and flower-clusters arranged in groups of 3 instead of in pairs as in the other species.

Occurrence.—ZION. GRAND CANYON, rare: inner gorge of the canyon; Kaibab trail just above Tonto; Grand Falls, Little Colorado River.

4. VINE EPHEDRA (*Ephedra antisyphilitica* Mey.).—Large shrub with lax, prostrate or reclining stems 6 to 9 feet long; flower groups in pairs at the stem-joints.

Occurrence.—MESA VERDE.

LILY FAMILY (Liliaceae)

YUCCA (*Yucca L.*)

The yuccas occur mostly in the parks of the Southwest, although one species is found in Sequoia National Park. The plants are very easily recognized by their long, stiff, fibrous, bristle-pointed leaves clustered together at or near the ground with a single flowering stalk arising from the center. In *Yucca Whipplei* the stalk may be as much as 14 feet tall, while in other species it may be shorter than the leaves. The yuccas were an important source of food for the Indians of the Southwest who still make use of these plants in various ways. Remains found in the cliff dwellings indicate that it was of great importance also to those ancient peoples. Every part of the plant was used. The flowering stalks, just before the buds opened, were peeled and cut into sections and either boiled or roasted in the ashes. The buds and fruits were also boiled and eaten. The leaves furnished fiber for making sandals, rope and cloth, and the large, thick roots were cut up into pieces and used for soap. "Amole," as this was called, is still used by the Indians in certain places. During the World War emergency yucca fiber was used as a substitute for jute for bagging.

The yucca flowers are particularly interesting because they bloom at night when pollination is accomplished by certain species of small moths. The flowers are so constructed that the fruits would never develop if it were not

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[7] *Ephedra Clokeyi* Cutler, similar to Nevada ephedra, is considered as the common form in our area by Cutler, H. C., Monograph of the North American Species of the Genus Ephedra. Missouri Bot. Gard. Annals 26: 373-428. 1939.

for these insects. "The female moth, working at night, collects pollen from one flower, then flies to another, lays her eggs in the seed-producing organ, and in a manner which corresponds to actions full of purpose and deliberation climbs to the style and thrusts the pollen ball down the stigmatic tube."[8] The young larvae, which hatch at just about the same time that the fruits are maturing, use the developing seeds for food. Hence the yuccas and moths are each dependent upon the other for the perpetuation of their respective species. Birds feed upon the fleshy fruits of the Spanish bayonet and help in the distribution of the seed.

FIELD GUIDE TO THE SPECIES

Flowering stem 1 to 3-1/2 feet high; leaves thick, concave, 1-1/2 to 2 feet long, 3/4 to 2 inches wide; fruits fleshy, about 6 inches long, pendent ..... 1. *Y. baccata.*

Flowering stem 3 to 14 feet high; leaves flattish, 2/3 to 1-3/4 feet long, narrow, 1/3 to 2/3 inch wide; fruits dry capsules, 1-1/4 to 2 inches long, erect.

Capsules constricted in the middle; leaves with free white marginal fibers; occurs in parks of the Southwest ..... 2. *Y. angustissima.*

Capules globose to reverse-egg-shaped; leaves without free marginal fibers; occurs in Sequoia National Park ..... 3. *Y. Whipplei.*

8 Jepson, W. L., Manual of the flowering plants of California, p. 246. 1925.

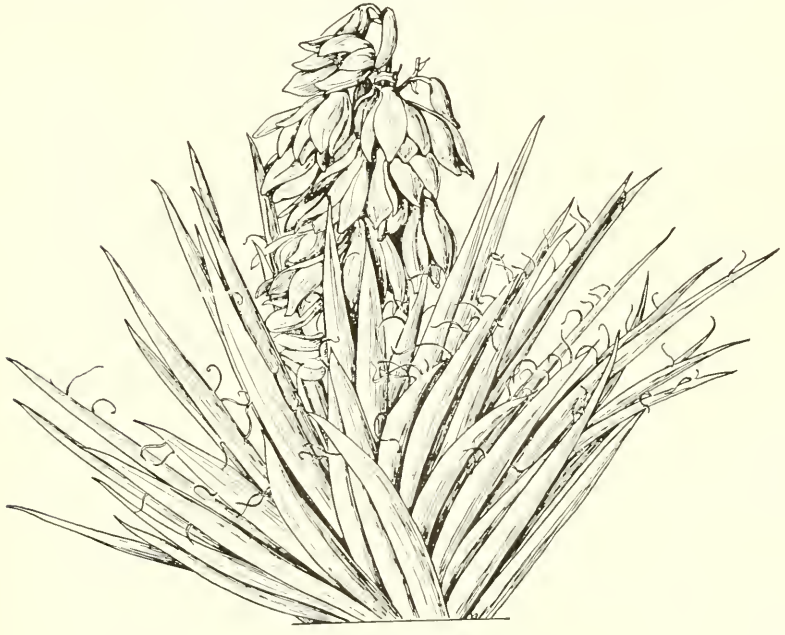

Fig. 6. Spanish bayonet (*Yucca baccata*).

1. SPANISH BAYONET, DATIL (*Yucca baccata* Torr.), fig. 6.—Leaves thick, rigid, spine-tipped, about 1½ to 2 feet long, 1 to 2 inches wide, dark yellow-green, the margins with wiry, white or brownish recurving fibers; flowering stalk about 1½ to 2½ feet high, the flower cluster usually exceeding the leaves by about 6 inches; flowers yellowish-white, purple-streaked on the outside; fruits pendent, dark purple, oblong or ovoid, about 6 inches long and 2 to 2½ inches wide at the base, becoming plump and rounded or with the upper third constricted.

The common name, datil, means little date. The species is also called banana yucca because of the large fleshy fruits. They are sweet and edible and were important as food for the Indians.

Occurrence.—MESA VERDE, common, 6,000 to 7,000 feet: Spruce Canyon below park headquarters. ZION. GRAND CANYON, 3,800 to 8,000 feet. North Rim near edge of rim: Point Sublime. South Rim: near Powell Memorial; Yavapai Observation station. Canyon, common: Bright Angel trail above Indian Gardens; Cedar Ridge along Kaibab trail near fossil fern quarry.

Var. *vespertina* McKelvey. — Differs from *Y. baccata* in having many short erect stems and forming dense clumps; leaves pale bluish- or sage-green, often twisted or curved, narrower than in the species and strongly concave as if folded lengthwise, mostly shorter, the marginal fibers usually finer and rather long; flower clusters smaller and less conspicuous, often almost hidden in the foliage.

Occurrence.—ZION.

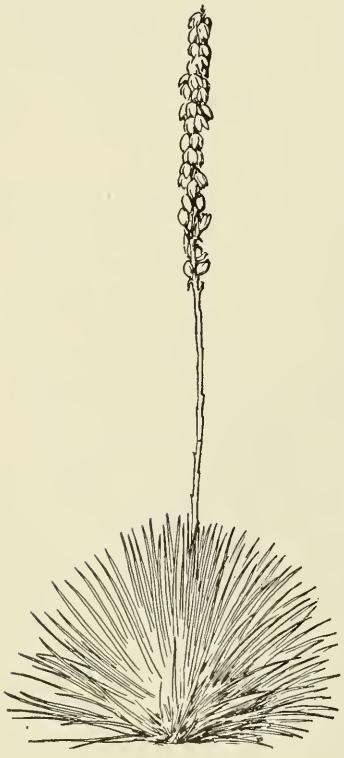

Fig. 7. Narrowleaf yucca (*Yucca angustissima*).

2. NARROWLEAF YUCCA (*Yucca angustissima* Engelm.), fig. 7.—Leaves about 8 inches to 1½ feet long, mostly less than ½ inch wide, flat and strap-like, tough, white-margined and with fine white fibers curling back from the margins; flowering stalk about 3 to 5 (or 6) feet tall, often with short branches; flowers creamy white, petals narrow; capsules oblong, about 1½ to 2 inches long, rough, brown, weathering white, constricted in the middle. (Syn. *Y. Harrimaniae* Trelease, *Y. Baileyi* as to western parks.)

Occurrence.—BRYCE CANYON. ZION, occasional in the Sonoran Zone, 4,200 to 7,000 feet: highway near east entrance; Zion Lodge; north of Potato Hollow. GRAND CANYON, 3,800 to 7,000 feet. South Rim: Yavapai observation station. Canyon: Kaibab trail on the Tonto; Bright Angel trail near Indian Gardens.

Fig. 8. Mescal (*Agave utahensis*).

3. CHAPARREL YUCCA, QUIXOTE PLANT (*Yucca Whipplei* Torr.).—Leaves narrow, about 1 to 1¾ feet long; flowering stalk 6 to 12 feet high; flowers creamy white, 1¼ to 1½ inches long; capsule oblong or nearly round (globose), 1¼ to 2 inches long. After the fruit matures the whole plant dies and new plants may arise from the base.

Occurrence.—SEQUOIA, occasional on limestone formations in chaparral belts: near Ash Mountain.

AMARYLLIS FAMILY (Amaryllidaceae)

MESCAL, MAGUEY (*Agave utahensis* Engelm.), fig. 8.—Erect, thick-stemmed plants; leaves borne in basal cluster, thick, fleshy, 6 to 12 inches long, the margins armed with white spine-tipped teeth; flowering stalks mostly 6 to 15 feet tall, arising from the center of the leaf cluster; flowers yellow, about 1 inch long, borne in several-flowered clusters along the upper part of the flowering stalk; petals (perianth segments) 6, borne at the top of the ovary which develops into the fruit; capsules light brown, 1 to 1½ inches long; seeds many, flattened, black.

It usually takes fifteen or more years for the *Agave* plant to develop to the flowering stage. The flowering stalk develops rapidly, often becoming twelve or fifteen feet tall. Another species of *Agave* known as century plant is grown in Mexico for its juice from which is made an intoxicating drink known as *pulque*.

Occurrence.—GRAND CANYON, 2,500 to 7,000 feet. North Rim, rare: Cape Royal. South Rim, occasional: Desert View; Grandview Point. Canyon, abundant: Kaibab trail near fossil fern quarry on Cedar Ridge; Tonto on both sides of the Colorado River; near Indian Gardens; Plateau Point; Havasupai Indian Reservation; slopes below Indian Watch Tower.

WILLOW FAMILY (Salicaceae)

WILLOW (*Salix* L.)

There are many shrubby species of willow in the western national parks, as well as tree species which often become shrubby in form. Willows grow commonly along streams, but many of the shrubby species are found on open slopes or in moist meadows, often forming thickets. Tiny prostrate alpine forms inhabit alpine meadows or rocky slopes above timberline where they may be only a few inches high. These are easily recognized as willows, however, by their characteristic leaves and catkins.

As a group the willows are very easily recognized, although it is often difficult to distinguish between many of the species. The leaves, which are borne alternately, usually have at their base a pair of small leaf-like structures called stipules. A characteristic bitter taste of the stems is due to tannin and other bitter principles contained in the bark. The flowers, without petals, are borne in the axils of tiny scales or bracts in dense oblong clusters or catkins which are popularly called pussy willows, the male or pollen-bearing catkins and female or seed-producing catkins occurring on separate plants. The color and hairiness of the scales of the catkins are important in the identification of the species. The fruits are tiny capsules which split down the sides to free cottony seeds.

Willows are extremely important along streams where the roots help in binding the soil and protecting the banks from erosion. The herbage furnishes valuable browse for animals and the bark is an important source of food for beaver and other animals. Growth is very rapid and recovery quick after the twigs are eaten off. The tough slender stems, which are very flexible, were used for many purposes by the Indians, especially for basket-making. In Europe willows are often grown for making baskets and wicker furniture. A fiber obtained from the bark has been used as cordage.

FIELD GUIDE TO THE SPECIES[9]

A. LOW, PROSTRATE PLANTS LESS THAN 6 INCHES HIGH.

Leaves 1/4 inch long or less; capsules smooth; occurs in Yellowstone National Park ..... 1. *S. Dodgeana.*

Leaves mostly more than 1/4 inch long; capsules hairy.

Leaves egg-shaped or elliptic to reverse-egg-shaped or roundish, bright green above.

Dwarf creeping shrub; leaves 1/3 to 1/2 inch long, whitish below; scales yellowish; styles very short or none ..... 2. *S. nivalis.*

Plants more or less prostrate, or up to 3 feet high or more; leaves 1/2 to 2 inches long, pale below or sometimes whitish; scales dark brown; style 1 mm. or more long ..... 39. *S. planifolia.*

Leaves narrowly elliptic to reverse-egg-shaped, dull green above; scales brownish; styles 1 mm. or more long.

Leaves 1/3 to 1 inch long, hairy on the margins, paler or whitish below ..... 3. *S. petrophila.*

Leaves 1/4 to 1/2 inch long, smooth and green below ..... 4. *S. cascadensis.*

B. ERECT SHRUBS MORE THAN 6 INCHES HIGH.

1. *Leaves mostly linear to narrowly lance-shaped, mostly more than 4 to 5 times longer than wide.*

Scales of catkins yellowish, soon falling; leaves all narrow, green on both sides or sometimes whitish below.

Leaves and leaf-stalks not glandular; stamens 2.

Capsules not hairy or thinly hairy; leaves 1 1/2 to 6 inches long, smooth or hairy.

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9 Throughout the section on willows the millimeter scale has been used to indicate very small measurements less than 1/12 of an inch.

Leaves lance-shaped, 1½ to 3 inches long, dark green above, paler below; found in parks of California and at Glacier National Park ..... 5. *S. melanopsis.*

Leaves linear, 2 to 6 inches long, grayish-green on both sides; found in Rocky Mountains and Southwest ..... 6. *S. exigua.*

Capsules hairy (sometimes smooth in age); leaves 1½ to 3½ inches long, hairy.

Found in Southwest parks ..... 7. *S. taxifolia.*

Found in Pacific slope parks ..... 8. *S. Hindsiana.*

Leaf-stalks and bases of leaves glandular; stamens 3 to 9; capsules smooth.

Leaves lance-shaped, long-pointed, 2 to 5½ inches long ..... 9. *S. caudata.*

Leaves elliptic-lance-shaped, short-pointed, 2 to 3 inches long ..... 10. *S. serissima.*

Scales of catkins brownish, persistent; leaves not all linear.

Leaves dark green above, whitish below, not hairy or thinly so; catkins naked at base, appearing before the leaves; capsules smooth or sometimes thinly hairy.

Leaves of flowering shoots narrowly elliptic-oblong, ⅝ to 1¼ inches long; summer leaves up to 6 inches long; found in Rocky Mountain National Park ..... 11. *S. irrorata.*

Leaves linear to narrowly reverse-egg-shaped, 2 to 5 inches long; found in Pacific Slope parks ..... 28. *S. lasiolepis.*

Leaves green above, densely silky, woolly, or velvety below; catkins leafy-bracted at base, appearing with the leaves; capsules silky or woolly.

Branchlets smooth; leaves silky-hairy below; found in Yosemite and Sequoia National Parks ..... 45. *S. Jepsoni.*

Branchlets at first white-woolly or hairy, becoming smooth; leaves woolly or velvety below; not found west of the Rocky Mountains.

Leaves dull below with fine white wool; styles reddish; western species found in Glacier National Park ..... 46. *S. candida.*

Leaves lustrous below with velvety hairs; styles yellowish; eastern species reported from Isle Royale ..... 47. *S. pellita.*

2. *Leaves mostly lance-shaped to oval, egg-shaped, or roundish, mostly less than 4 to 5 times longer than wide.*

a. Scales of catkins yellowish, persistent (or soon falling in *S. Geyeriana.*)

Leaves green on both sides, sometimes paler below, but not whitish.

Leaves narrowly lance-shaped or reverse-lance-shaped to elliptic-oblong; silky or woolly on both sides at first, becoming smooth; filaments of stamens hairy at base.

Small shrubs ½ to 3 feet high; twigs and leaves yellowish-woolly; scales of catkins persistent; styles 1 to 1½ mm. long ..... 12. *S. brachycarpa.*

Larger shrub, 3 to 12 feet high; leaves silky-hairy; scales of catkins soon falling; styles very short ..... 13. *S. Geyeriana.*

Leaves reverse-egg-shaped to broadly lance-shaped or oblong-elliptic, smooth or somewhat gray-woolly below; filaments smooth.

Shrubs 6 to 12 feet high; leaves 1 to 2 inches long, smooth or woolly below; capsules thinly hairy; found in western parks ..... 14. *S. Bebbiana.*

Shrubs 3 to 6 feet high; leaves ½ to 1½ inches long, smooth; capsules smooth; found on Isle Royale ..... 15. *S. pedicellaris.*

Leaves whitish below.

Leaves finely toothed, at first slightly silky, becoming smooth; styles very short or none; found in Rocky Mountain National Park .....16. *S. petiolaris.*

Leaves not toothed or scarcely so, hairy on both sides, at least when young; styles 1 mm. or more long; found in Rocky Mountain parks .....17. *S. pseudolapponum.*

b. Scales of catkins brown or blackish, at least at tips, persistent.

Leaves about equally hairy on both sides, at least when young.

Leaves somewhat whitish below, not toothed or scarcely so.

Leaves gray-woolly; scales of catkins dark at tips; found in Rocky Mountain parks .....17. *S. pseudolapponum.*

Leaves long silky-hairy; scales of catkins dark; found in Pacific Slope parks .....18. *S. orestera.*

Leaves green on both sides, densely long-hairy, not toothed or with fine glandular teeth.

Leaves 1 inch or less long (or up to 2 inches in var.), silvery-hairy, not toothed; Rocky Mountain parks (except Glacier) .....19. *S. Wolfi* & var.

Leaves mostly 1 to 2½ (or 3½) inches long, more or less glandular-toothed, long-hairy or woolly; found in Pacific Slope parks or at Glacier National Park.

Leaves about 1 to 2½ inches long; styles 1 to 1½ mm. long; mostly Pacific Slope species.

Filaments hairy below; capsules softly gray-hairy; in Sierra Nevada parks and at Crater Lake .....20. *S. Eastwoodiae.*

Filaments smooth; capsules smooth or very finely woolly; found in Northwest and in Glacier National Park .....21. *S. commutata.*

Leaves 1½ to 3½ inches long; styles 1½ to 2½ mm. long; found in Glacier National Park .....22. *S. Barrattiana.*

Leaves smooth, or hairy only below (sometimes thinly hairy above also).

Capsules smooth (sometimes thinly hairy in *S. Barclayi* and *S. lasiolepis*); leaves smooth on both sides at maturity or sometimes hairy below (sometimes thinly hairy above in *S. Barclayi.*)

Styles 1 mm. or more long.

Styles 1½ to 2½ mm. long; leaves glandular; found in Yellowstone and Grand Teton National Parks .....23. *S. Tweedyi.*

Styles not over 1½ mm. long; leaves not glandular.

Leaves smooth on both sides (sometimes thinly hairy above in *S. Barclayi*).

Branchlets finely hairy or nearly smooth; catkins borne on distinct stalks; found in the Northwest and Yellowstone National Park .....24. *S. Barclayi.*

Branchlets smooth and shining; catkins scarcely if at all stalked.

Stamens with filaments distinct; found in parks of the Rocky Mountains .....25. *S. pseudomonticola.*

Stamens with filaments joined at base; found in parks of the Northwest .....26. *S. Piperi.*

Leaves more or less hairy, at least below; found in Rocky Mountain National Park .....27. *S. monticola.*

Styles mostly less than 1 mm. long.

Leaves mostly not toothed, or remotely toothed.

Tall shrubs 5 to 12 (or 30) feet high; leaves 2½ to 5 inches long.

Leaves of flowering shoots narrowly elliptic-oblong, ⅝ to 1¼ inches long; summer leaves up to 6 inches long;; found in Rocky Mountain National Park .....11. *S. irrorata.*

Leaves mostly linear to narrowly reverse-egg-shaped, 2 to 5 inches long; found in Pacific Slope parks ....28. *S. lasiolepis.*

Low shrubs not more than 6 feet high; leaves mostly less than 2 inches long.

Shrubs 3 to 6 feet high; scales of catkins yellowish, often colored at tips; eastern species found on Isle Royale .....15. *S. pedicellaris.*

Shrubs 1 to 2 feet high; scales of catkins brownish at tips; western species found in Rocky Mountains ....29. *S. Farrae.*

Leaves mostly finely toothed.

Mature leaves firm, thickish.

Leaves whitish below; stalks of capsules 2½ to 4 mm. long .....30. *S. Mackenziana.*

Leaves green on both sides; stalks of capsules 1 to 1½ mm. long .....31. *S. pseudocordata.*

Mature leaves thinnish.

Twigs yellowish; leaves yellowish-green .....32. *S. lutea.*

Twigs reddish or olive; leaves dark green above.

Filaments of stamens joined at base; western species .....33. *S. monochroma.*

Filaments of stamens distinct; eastern species found on Isle Royale .....34. *S. pyrifolia.*

Capsules hairy; leaves hairy below or covered with a whitish bloom.

Leaves roundish to broadly elliptic or in variety narrowly elliptic with pointed tips, dark green and strongly veined above, densely long-white-hairy below; style none; occurs in Glacier National Park .....35. *S. vestita.*

Leaves egg-shaped or reverse-egg-shaped to narrowly lance-shaped or reverse-lance-shaped or sometimes almost linear, not strongly veined above, smooth or hairy below; styles evident or none.

Catkins mostly appearing before the leaves, mostly naked at base; styles very short or none.

Leaves reverse-egg-shaped or elliptic-oblong to reverse-lance-shaped, abruptly pointed to rounded at the tips; catkins thick.

Western species common in most of the western national parks; leaves smooth or hairy below; catkins oblong or elliptic, ½ to 1 inch long ....36. *S. Scouleriana.*

Eastern species found on Isle Royale.

Leaves softly hairy below and also above when young, wavy-margined but not toothed; catkins egg-shaped to elliptic, ½ to 1½ inches long ....37. *S. humilis.*

Leaves smooth below, irregularly scallop-toothed; catkins cylindric, 1 to 3 inches long ....38. *S. discolor.*

Leaves narrowly lance-shaped, with slender-pointed tips, finely toothed; catkins narrowly egg-shaped, broad and loose in fruit, about ¾ to 1½ inches long; found in Rocky Mountain and Isle Royale National Parks ....16. *S. petiolaris.*

Catkins appearing with the leaves, mostly leafy-bracted at base; styles evident or none.

Leaves smooth on both sides.

Leaves egg-shaped to reverse-egg-shaped or oblong, ½ to 2 inches long; filaments of stamens smooth; capsules not stalked, the style 1 mm. or more long ....39. *S. planifolia.*

Leaves elliptic-lance-shaped to reverse-lance-shaped, 1½ to 4 inches long; filaments of stamens finely hairy at base; capsules on stalks 1½ to 2 mm. long, the styles very short ....40. *S. Lemmoni.*

Leaves hairy below.

Leaves mostly ½ inch or more wide; silky below.

Stamens 2; found east of Great Western Divide.

Branchlets hoary with a dense white bloom; styles 1 to 1½ mm. long .....41. *S. subcoerulea.*

Branchlets smooth or becoming so; styles ½ to 1 mm. long .....42. *S. Drummondiana.*

Stamens single; found in Pacific Slope parks.

Branchlets slender, rarely hairy; anthers purple ....43. *S. sitchensis.*

Branchlets stoutish, more or less hairy; anthers yellow .....44. *S. Coulteri.*

Leaves mostly less than ½ inch wide, silky or woolly-velvety below.

Branchlets smooth; leaves silky-hairy below; found in Yosemite and Sequoia National Parks ....45. *S. Jepsoni.*

Branchlets at first white-woolly or hairy, becoming smooth; leaves white below with fine wool or velvety hairs; found east of Great Western Divide.

Leaves dull below with fine white wool; anthers red; found in Glacier National Park..... ....46. *S. candida.*

Leaves lustrous below with velvety hairs; anthers yellow; found on Isle Royale ....47. *S. pellita.*

1. DODGE'S WILLOW, DWARF ALPINE WILLOW (*Salix Dodgeana* Rydb.).—Minute prostrate alpine shrub only 1 inch high; leaves tiny, less than ¼ inch long; male catkins 3- or 4-flowered, the stamens 2 with filaments not hairy; female catkins mostly 2-flowered; capsules smooth.

Occurrence.—YELLOWSTONE: covers large areas on slopes of Electric Peak, 9,600 feet.

2. SNOW WILLOW (*Salix nivalis* Hook.).—Low creeping dwarf shrub, usually with stems lying flat on the ground; leaves elliptic to reverse-egg-shaped or roundish, 1/3 to ½ inch long, dark green and shining above, whitish below and prominently veined, the margins not toothed; catkins appearing after the leaves, few-flowered, less than ⅜ inch long; scales yellowish, not hairy or scarcely so; stamens 2, the fllaments not hairy; capsules finely hairy or scarcely so, the style very short or none.

Occurrence.—OLYMPIC: Mount Angeles, 5,500 feet; Marmot Pass. MOUNT RAINIER, rare, 4,000 to 6,000 feet. GLACIER, occasional, about 7,000 feet: Siyeh Pass; rocks above Sue Lake; Cutbank Pass; Gunsight Pass. YELLOWSTONE: summit of Electric Peak, 11,000 feet. GRAND TETON.

2a. SUMMIT WILLOW (Var. *saximontana* Rydb. Schneid.).—Similar to the species except leaves usually larger, ¾ to 1½ inches long; catkins larger, usually many-flowered.

Occurrence.—GLACIER, about 7,000 feet. YELLOWSTONE, occasional. ROCKY MOUNTAIN: Long Lake, 10,200 feet.

Kirkwood[10] suggests that *S. nivalis* and var. *saximontana* are but variations of the Old World species, *S. reticulata* L., "becoming enlarged or depauperate and variously modified in accordance with shelter or exposure in severe situations of high altitude."

Fig. 9. Skyland willow (*Salix petrophila*).

3. SKYLAND WILLOW (*Salix petrophila* Rybd.), fig. 9.—Low prostrate shrub with erect stems 2 to 4 inches high, often forming carpet-like mats on moist rocky slopes or in rocky alpine meadows; leaves 1/3 to 1 inch long, elliptic to reverse-egg-shaped, smooth or hairy only on the margins, dull green above, paler below, the margins not toothed; catkins appearing with the leaves, the staminate ½ to ¾ inch long, the seed-bearing catkins ¾ to 1¾ inches long; scales dark, hairy; stamens 2, the filaments distinct, not hairy; capsules finely hairy, the style 1 to 1½ mm. long. The specific name, *petrophila*, comes from two Greek words meaning rock and loving, referring

10 Kirkwood, J. E., Northern Rocky Mountain Trees and Shrubs, p. 93. 1930.

to the characteristic habitat of this species. (Syns. *S. arctica* Br. and var. *petraea* Anderss., *S. anglorum* var. *araioclada* Schn. and var. *kophophylla* Schn. of Standley's Flora of Glacier Park.)

Occurrence.—LASSEN: Lassen Peak; Emerald Lake. GLACIER, abundant above timberline, 6,000 to 9,000 feet: Iceberg Lake; Swiftcurrent Pass; Ptarmigan Lake; Piegan Pass; Logan Pass; Cut Bank Pass; Sperry Glacier trail. YELLOWSTONE, common: Mount Washburn, 10,200 feet. GRAND TETON. ROCKY MOUNTAIN, occasional: Trail Ridge, 11,500 feet.

3a. TUFTED SKYLAND WILLOW (Var. *caespitosa* Schn.)—.Similar to the species but the leaves more narrowly elliptic or reverse-egg-shaped, pointed at both ends, thinly hairy above or along the margins.

Occurrence.—YOSEMITE, common, 10,000 to 11,000 feet: Mount Dana; Mount Lyell; Vogelsang Pass; Mono Pass; Gaylor Lakes; above Fletcher Lake. KINGS CANYON: Harrison Pass trail; Reflection Lake; Bullfrog Lake; Mount Brewer. SEQUOIA, common, 9,000 to 11,000 feet: above Pear Lake; Mount Whitney; Milestone Plateau; Little Five Lakes; Big Five Lakes.

4. CASCADE WILLOW (*Salix cascadensis* Ckl.).—Dwarf creeping plant 1 to 2 inches above the ground; leaves narrowly elliptic to reverse-egg-shaped, 1/4 to 1/2 inch long, green and smooth on both sides, strongly veined, capsules hairy; styles 1 to 1 1/2 mm. long. (Syn. *S. tenera* Anderss.)

Occurrence.—OLYMPIC: Mount Claywood; Diamond Mountain; Marmot Pass. MOUNT RAINIER, on rocky alpine summits. GLACIER, on rocky slopes above timberline: Sexton Glacier. YELLOWSTONE: Mount Washburn, 10,000 feet.

5. DUSKY WILLOW (*Salix melanopsis* Nutt.).—Shrub or small tree 6 to 15 feet high; leaves 1 1/2 to 3 inches long, linear lance-shaped to narrowly elliptic, tapering at both ends, dark green above, paler below, somewhat hairy when young, the margins irregularly toothed; catkins appearing after the leaves, 3/4 to 1 1/2 inches long; scales yellowish; stamens 2, the filaments hairy below; capsules not hairy; styles very short or none. (Syns. *S. Bolanderiana* Rowl., *S. longifolia* Jepson, *S. fluviatilis* auth., not Nutt.).

Occurrence.—YOSEMITE, 2,500 to 5,000 feet: Yosemite Valley; El Portal; Wawona. KINGS CANYON, at lower elevations. SEQUOIA: western boundary of park. GLACIER, common, 3,100 to 5,250 feet: North Fork Flathead River; south of Kishenehn ranger station; shore of St. Mary Lake near East Glacier campgrounds; outlet of St. Mary Lake; Divide Lake. YELLOWSTONE.

6. COYOTE WILLOW, SANDBAR WILLOW (*Salix exigua* Nutt.).—Shrub 5 to 15 feet high, commonly found growing in sandy soil along streams, often forming thickets; leaves mostly linear, 2 to 6 inches long, more or less hairy on both sides, the margins toothed or not toothed; catkins appearing after the leaves, borne on short leafy stalks; scales yellowish, soon falling; stamens 2, the filaments hairy below; capsules not hairy or thinly hairy; styles none. The Indians stripped the long slender branches and used them for basket-making.

Occurrence.—GLACIER, rare: Two Medicine Creek near Glacier Park. ROCKY MOUNTAIN, about 7,500 feet. MESA VERDE. BRYCE CANYON. ZION: near Zion Lodge, 4,200 feet. GRAND CANYON, in the canyon, 2,500 to 4,200 feet: Indian Gardens; near Phan-

tom Ranch; Bright Angel Creek about 2 miles above Phantom Ranch; Cottonwood Camp, along Kaibab trail; YELLOWSTONE.

7. YEWLEAF WILLOW (*Salix taxifolia* H. B. K.).—Tall shrub or a tree; foliage similar to that of sandbar willow but the leaves shorter, 1 to 3 inches long, and the capsules hairy.

Occurrence.—ZION: near Coalpits Wash. GRAND CANYON, South Rim.

8. HINDS WILLOW (*Salix Hindsiana* Benth.).—Erect shrub or small tree 6 to 25 feet high; leaves linear to linear-lance-shaped, 1½ to 3½ inches long, more or less hairy, those of young shoots often densely silky, the margins not toothed or rarely few-toothed; catkins appearing after the leaves, ⅜ to 1 inch long, borne on short leafy stalks; scales yellowish, soon falling; stamens 2, the filaments hairy; capsules silky-hairy or becoming smooth; styles evident.

Occurrence.—CRATER LAKE. YOSEMITE: Bear Camp on Big Oak Flat road, 6,000 feet.

9. WHIPLASH WILLOW (*Salix caudata* (Nutt.) Hell.).—Spreading shrub 1 to 15 feet high; twigs reddish, shiny leaves linear-lance-shaped to lance-shaped, long-pointed at the tips, the leaf-stalks and bases of leaf-blades glandular, the margins gland-toothed; scales yellowish, not hairy, soon falling; stamens 3 to 9; capsules smooth; styles very short.

Occurrence.—GLACIER, rare at low altitudes. (A small leaved form found along Swiftcurrent Creek has been designated variety *parvifolia* by C. R. Ball.) ROCKY MOUNTAIN, abundant at lower altitudes.

9a. BRYANT WILLOW (Var. *Bryantiana* Ball & Bracelin).—Shrub 3 to 15 feet high with several stems clustered at base; twigs reddish-brown, smooth and shining; leaves lance-shaped to oblong-lance-shaped, 3¼ to 5½ inches long, dark green and smooth above, paler below; filaments hairy below; capsules smooth; styles evident. (Syn. *S. Fendleriana* Anderss. of the Plants of Yellowstone National Park.) [11]

Occurrence.—YELLOWSTONE. GRAND TETON: near Moose, eastern park boundary. ROCKY MOUNTAIN, abundant at lower alittudes.

10. AUTUMN WILLOW (*Salix serissima* (Bailey) Fern.).—Tall shrub; leaves 2 to 3 inches long, ¼ to ½ inch wide, elliptic-lance-shaped, short-pointed, green above, slightly paler below, the margins finely toothed; catkins borne on short leafy branchlets; scales yellowish, soon falling; stamens 3 or more, the filaments hairy below; capsules smooth, the styles very short or none.

Occurrence.—GLACIER, rare on east side: Swiftcurrent Lake. ROCKY MOUNTAIN, rare: Long's Peak Inn, 9,000 feet.

11. BLUESTEM WILLOW (*Salix irrorata* Anderss.).—Shrub 5 to 12 feet high, the stems dark purplish, at first covered with a whitish bloom, the foliage with a bluish-gray aspect; leaves firm, dark green above, whitish below, not toothed or remotely toothed, those of the summer foliage narrowly lance-

11 McDougall, W. B., and Baggley, H. A., Plants of Yellowstone National Park, p. 47. Washington D. C. 1936.

shaped, abruptly pointed at the tips, 2 to 6 inches long; leaves of flowering branches at first short, 5/8 to 1¼ inches long, narrowly elliptic-oblong; catkins appearing before the leaves, naked at base, not stalked; scales brownish, densely white-hairy; stamens 2, the filaments distinct; capsules smooth, short-stalked, the style short.

Occurrence.—ROCKY MOUNTAIN, 7,500 to 8,500 feet: west of Mount Bryant.

12. BARRENGROUND WILLOW (*Salix brachycarpa* Nutt.).—Small shrub 6 inches to 3 feet high, forming clumps; foliage yellow-woolly or becoming smooth; leaves elliptic-oblong to reverse-lance-shaped, 3/8 to 1¼ inches long; catkins borne on short leafy branchlets; scales yellowish, persistent, hairy; stamens 2, the filaments hairy below; capsules woolly, scarcely stalked, the styles 1 to 1½ mm. long. (Syn. *S. stricta* (Anderss.) Rydb.).

Occurrence.—GLACIER, occasional above timberline: Piegan Pass; Appekunny Creek. YELLOWSTONE PARK: Lower Geyser Basin; Yellowstone Falls; Soda Butte Creek. GRAND TETON: head of Granite Canyon, 9,000 feet. ROCKY MOUNTAIN, 7,500 to 11,500 feet: Trail Ridge; Estes Park.

13. GEYER WILLOW (*Salix Geyeriana* Anderss.).—Spreading shrub 3 to 12 feet high; leaves 1 to 2½ inches long, narrowly lance-shaped, thinly silky-hairy on both sides, the margins not toothed; catkins lax, appearing with the leaves, borne on short stalks; scales yellowish, soon falling; stamens 2, the filaments hairy below; capsules hairy, the style almost none. (Syn. *S. macrocarpa* Nutt.).

Occurrence.—MOUNT RAINIER, rare, in open woods near streams: swamps in Nisqually Valley. GLACIER: Belton, 3,100 feet. YELLOWSTONE, occasional: between Mammoth and Gardiner; Tower Junction. GRAND TETON. ROCKY MOUNTAIN, 7,500 feet to 9,000 feet: Estes Park. ZION, in cool canyons on the plateaus.

13a. SILVERY GEYER WILLOW (Var. *argentea* (Bebb) Schn.).—Leaves silky below; capsules borne in roundish catkins about 1/3 to ¾ inch long.

Occurrence.—YOSEMITE, 7,000 ot 9,000 feet: Lyell Fork Merced River near Mount Lyell; Tuolumne Meadows. SEQUOIA, 8,000 to 9,000 feet: Whitney Meadows. YELLOWSTONE. ROCKY MOUNTAIN, common, 7,500 to 9,000 feet.

14. BEBB WILLOW (*Salix Bebbiana* Sarg.).—Slender shrub with stems clustered at the base, 6 to 12 feet high, often occurring with shrubby vegetation on open mountain slopes; leaves 1 to 2 inches long, elliptic to broadly lance-shaped, dull green above, somewhat paler below, more or less gray-woolly at least below (becoming smooth in var.), the margins not toothed or scarcely so, often somewhat wavy; catkins lax, appearing with the leaves; scales pale, persistent; stamens 2, the filaments not hairy; capsules thinly hairy, the styles less than ½ mm. long or none. (Syn. *S. rostrata* Rich.).

Occurrence.—GLACIER, common, 3,100 to 6,000 feet: Belton Hills; outlet to Bowman Lake; Skyline Trail to Granite Park; Blackfeet Highway near Two-Medicine Ridge.

14a. SMOOTH BEBB WILLOW (Var. *perrostrata* (Rydb.) Schn.).—Differs from species in having leaves thinner and soon becoming smooth.

Occurrence.—GLACIER: with the species. YELLOWSTONE: along streams at Mammoth;

vicinity of Rustic Falls; Tower Falls; Old Faithful. GRAND TETON: southeastern park boundary near Moose. ROCKY MOUNTAIN, common. ZION. GRAND CANYON, on the North Rim: Point Imperial.

15. INTEROCEAN BOG WILLOW (*Salix pedicellaris* Pursh var. *hypoglauca* Fernald).—Shrubs 3 to 6 feet high; leaves oblong-elliptic to reverse-egg-shaped, rather blunt-pointed, tapered to the base, ½ to 1½ inches long, smooth, firm when mature, not toothed, finely veined; catkins appearing with the leaves, borne on leafy stalks, loosely few-flowered; scales greenish-yellow, sometimes colored at the tips, persistent; stamens 2, the filaments smooth and distinct; capsules smooth, on stalks 2 to 3 mm. long; styles very short or none. This is a shrub of sphagnum bogs and wet meadows.

Occurrence.—ISLE ROYALE: Scoville Point; Raspberry Island.

16. SLENDER WILLOW (*Salix petiolaris* Sm.).—Shrub 3 to 12 feet high with slender purplish twigs; leaves narrowly lance-shaped, taper-pointed, ¾ to 3 inches long, finely toothed, dark green and shining above, whitish below, at first slightly silky, becoming smooth; catkins appearing before or with the leaves, naked or sometimes with a few leafy bracts at base; scales pale brown or yellowish, persistent, white-hairy; stamens 2, the filaments smooth and distinct; capsules finely hairy, borne on stalks 2 to 3 mm. long, the styles short or none.

Occurrence.—ROCKY MOUNTAIN, 7,500 feet.

17. GRAYLEAF WILLOW (*Salix pseudolapponum* v. Seem.).—Low shrub 1 to 5 feet high, forming clumps; leaves elliptic to reverse-lance-shaped, 1¼ to 2 inches long, dull green above, whitish below, hairy on both sides, not toothed or scarcely so; catkins appearing after the leaves, leafy-bracted at base; scales yellowish or dark at tips; stamens 2, the filaments smooth or finely hairy at base; capsules gray-woolly, borne on stalks 1 mm. long; styles 1 mm. or more long. (Syns. *S. glaucops* Anderss, as to our area, *S. glauca* var. *glabrescens* Schn.).

Occurrence.—GLACIER, frequent in meadows above timberline: Swiftcurrent Creek below Swiftcurrent Lake. YELLOWSTONE: Mount Washburn, 9,000 feet. ROCKY MOUNTAIN, 7,500 to 11,500 feet: Trail Ridge; Poudre Lakes.

18. GRAYLEAF SIERRA WILLOW (*Salix orestera* Schn.).—Shrub 2 to 5 feet high with many stems from the base; leaves narrowly elliptic to lance-shaped, 1 to 2½ inches long, green above, whitish below, silky-hairy on both sides, not toothed or scarcely so; catkins appearing with the leaves, on short leafy stalks, or not stalked; scales dark, hairy; stamens 2, the filaments smooth; capsules finely silky-hairy, stalked, the styles long. (Syn. *S. glauca* L. var. *orestera Jepson* and var. *villosa* Jepson).

Occurrence.—CRATER LAKE, common: Annie Spring, near park headquarters. YOSEMITE, 8,000 to 11,000 feet: North Fork Merced River; above Fletcher Lake; Donohue Pass; Tioga Pass; Smedberg Lake; Matterhorn Canyon; Moraine Meadows; Grouse Lake; Tioga road; Tuolumne Meadows. KINGS CANYON, 7,500 to 10,000 feet: East Lake; Harrison Pass trail. SEQUOIA, 8,000 to 10,000 feet: Alta Meadows; northeast of Pear Lake; south shore of Twin Lakes; Crabtree Meadows; Farewell Gap.

19. WOLFS WILLOW (*Salix Wolfi* Bebb).—Small shrub 1 to 2 feet high, forming clumps; branchlets chestnut-brown to yellow, lustrous; leaves small, about 1 inch or less long, reverse-lance-shaped, more or less silvery-hairy on both sides, or becoming smooth, the margins not toothed; catkins small, roundish, less than ½ inch long, borne on short leafy stalks; scales dark, thinly long-hairy; stamens 2.

Occurrence.—ROCKY MOUNTAIN, common in wet meadows, 9,000 to 11,000 feet: Grand Lake region.

19a. IDAHO WILLOW (var. *idahoensis* Ball).—Shrubs larger, 3 to 6 feet high; leaves larger, 1 to 2 inches long; catkins mostly ½ to nearly 1 inch long; capsules finely hairy, the styles about 1 mm. long.

Occurrence.—YELLOWSTONE, abundant: south end of Specimen Ridge; meadow above Fishing Bridge; Yellowstone Lake; Tower Falls; Swan Lake. GRAND TETON: Surprise Lake; Indian Paint Brush Canyon.

20. EASTWOOD WILLOW (*Salix Eastwoodiae* Ckl.).—Shrub 2 to 6 feet high, often forming thickets along water courses and about meadows; branchlets usually dark brown, finely hairy; leaves elliptic to narrowly reverse-egg-shaped, grayish-long-hairy on both sides or becoming nearly smooth in age, the margins very finely gland-toothed; catkins appearing with the leaves, borne on short leafy stalks, the staminate ⅜ to 1 inch long, those bearing capsules ¾ to 1¾ inches long; scales brown, hairy; stamens 2, the filaments hairy at base; capsule hairy, the styles about 1 mm. long. (Syn. *S. californica* Bebb.).

Occurrence.—CRATER LAKE: Castlecrest Garden; Munson Valley; park headquarters. YOSEMITE, 7,500 to 10,000 feet: upper Gaylor Lake; Tuolumne Meadows; west of Tenaya Lake; Slide Canyon, Piute Creek; Peregoy Meadows; Snow Flat; Crescent Lake. KINGS CANYON, 7,000 ot 9,500 feet: East Lake. SEQUOIA: Giant Forest, 6,500 feet.

21. MOUNTAIN WILLOW (*Salix commutata* Bebb).—Low shrub 3 to 5 feet high, found along streams and about mountain meadows; leaves elliptic to reverse-egg-shaped, grayish on both sides with long hairs or sometimes nearly smooth in age, ¾ to 2½ inches long, the margins not toothed or with fine glandular teeth; catkins borne on short leafy stalks, appearing with the leaves; scales brown; stamens 2, the filaments free, not hairy; capsules smooth or very finely woolly, the styles 1 to 1½ mm. long.

Occurrence.—OLYMPIC, 4,000 to 5,000 feet: Martin's Park southeast of Low Divide; Dose Meadows; Marmot Pass; Queets River valley. MOUNT RAINIER, 4,000 to 6,000 feet: Paradise Valley. GLACIER, common, 6,000 to 7,500 feet: Swiftcurrent Pass; Iceberg Lake; Blackfoot Glacier; Logan Pass; Gunsight Lake.

22. BARRATT WILLOW (*Salix Barrattiana* Hook.).—Small shrub 1½ to 4 feet high; leaves elliptic-lance-shaped to reverse-lance-shaped, pointed at the tip, pointed to somewhat heart-shaped at base, 1½ to 3½ inches long, not toothed or with a few glandular teeth, gray-woolly on both sides; capsules densely hairy; styles 1½ to 2½ mm. long.

Occurrence.—GLACIER, rare; Gunsight Pass on rock slide.

23. TWEEDY WILLOW (*Salix Tweedyi* Ball).—Leaves smooth, glandular, whitish below; catkins not stalked; scales brown; capsules smooth, the styles 1½ to 2½ mm. long. (Syn. *S. Barrattiana* Hook. var. *Tweedyi* Bebb.).

Occurrence.—YELLOWSTONE; upper end of Slough Creek. GRAND TETON: head of Death Canyon, 9,000 feet.

24. BARCLAY WILLOW (*Salix Barclayi* Anderss.).—Bushy shrub 3 to 9 feet high, found along streams or in moist mountain meadows; twigs dark brown, finely hairy or nearly smooth; leaves oval or elliptic to reverse-lance-shaped, 1 to 2½ inches long, green above, whitish below, smooth on both sides or sometimes thinly hairy above; catkins about ⅜ to 1¼ inches long, on leafy stalks ¼ to 1¼ inches long, appearing with the leaves; scales persistent, brownish, long-hairy; stamens 2; capsules usually not hairy or sometimes thinly so, on stalks about 1 mm. long, the styles 1 to 1½ mm. long. This species furnishes good forage for animals.

Occurrence.—OLYMPIC, 3,500 to 5,000 feet: Boulder Creek above Olympic Hot Springs; Low Divide. MOUNT RAINIER, 4,000 to 6,000 feet: Reflection Lake; Paradise Valley; Mazama Ridge; Mowich Lake. YELLOWSTONE: Mammoth; Spring Creek; Old Faithful; Soda Butte Creek; De Lacy Creek; Gardiner.

25. FALSE MOUNTAIN WILLOW (*Salix pseudomonticola* Ball).—Shrub 3 to 10 feet high; branchlets yellowish to red or brown, becoming shiny; leaves elliptic to egg-shaped, 1½ to 3 inches long, pointed at the tip, rounded to heart-shaped at base, smooth and green above, whitish below, the margins coarsely glandular-toothed or not toothed; catkins appearing with the leaves, scarcely stalked but leafy-bracted at base; scales brown, long-hairy; stamens 2, the filaments distinct, not hairy; capsules smooth, on stalks 1 to 1½ mm. long, the styles about 1 mm. long or more.

Occurrence.—GLACIER, on the east side: Blackfeet Highway overlooking Lower Two-Medicine Lake. YELLOWSTONE: Ivy Springs near Junction Butte; Mammoth. ROCKY MOUNTAIN.

26. PIPER WILLOW (*Salix Piperi* Bebb).—Erect shrub 9 to 18 feet high, occurring along streams; branchlets stout, smooth, shining; leaves thickish, broadly elliptic to reverse-lance-shaped, 2½ to 5 inches long, dark green and shining above, whitish below, the margins finely toothed or not toothed; catkins appearing with the leaves or before, naked or leafy-bracted at base, 1 to 4 inches long, not stalked; scales brown, hairy; stamens 2, the filaments joined at base, not hairy; capsules smooth, on stalks 1 mm. long, the styles about 1 mm. long.

Occurrence.—OLYMPIC. MOUNT RAINIER.

27. ROCKY MOUNTAIN WILLOW (*Salix monticola* Bebb).—Shrub 6 to 18 feet high with smooth reddish-brown branchlets; leaves elliptic-oblong to broadly reverse-lance-shaped, 1½ to 3 inches long, hairy at least below, sometimes sparingly so; catkins borne on short leafy stalks; capsules smooth, the styles 1 mm. or more long.

Occurrence.—ROCKY MOUNTAIN, common, 7,500 to 9,000 feet: Estes Park.

28. ARROYO WILLOW (*Salix lasiolepis* Benth.).—Shrub or small tree 6 to 30 feet high with many stems from the base, commonly found along rocky streams; leaves narrowly reverse-egg-shaped to reverse-lance-shaped or rarely almost linear, 2 to 5 inches long, 1/2 to 1 inch wide, dark green and smooth above, whitish and often hairy below, the margins not toothed or scarcely so; catkins naked at base, appearing before the leaves, 1 to 2 3/4 inches long in fruit; scales brown, densely long-hairy; stamens 2, the filaments joined at base, not hairy; capsules smooth or very thinly hairy, borne on short stalks, the styles 1/2 to 1 mm. long.

Occurrence.—YOSEMITE. KINGS CANYON: switchbacks on Bubbs Creek trail. SEQUOIA: Hospital Rock.

29. FARR WILLOW (*Salix Farrae* Ball).—Small shrub about 1 to 2 feet high; branchlets red or reddish-yellow, shiny; leaves elliptic to broadly lance-shaped, 3/4 to 2 inches long, whitish below, not toothed or scarcely so; catkins appearing with the leaves, borne on short leafy stalks; scales brownish at tips, hairy on inside; stamens 2; capsules smooth, borne on stalks 1 to 1 1/2 mm. long, the style short, 1/2 mm. or less.

Occurrence.—GLACIER, frequent on east side in bogs or wet places, 5,500 to 6,500 feet: Gunsight Pass trail above Gunsight Lake; side of Bear Hat Mountain above Hidden Creek. YELLOWSTONE.

30. MACKENZIE WILLOW (*Salix Mackenziana* Barr.).—Shrub or small tree 6 to 12 feet high; branchlets dark brown or yellowish, shiny; leaves lance-shaped to oblong-lance-shaped, finely glandular-toothed, 2 to 4 inches long; dark green above, whitish below; catkins appearing with the leaves, borne on short leafy stalks; scales dark, hairy; stamens 2, the filaments distinct, not hairy; capsules smooth, on stalks 2 1/2 to 4 mm. long, the styles short, about 1/2 mm. long. (Syn. *Salix cordata* Muhl. var. *Mackenziana* Hook.).

Occurrence.—MOUNT RAINIER, not common. YOSEMITE, 4,000 to 6,000 feet: Yosemite Valley; Illilouette Canyon; Little Yosemite. SEQUOIA: head of Tocopah Canyon. GLACIER, rare: Belton. YELLOWSTONE: Mount Evarts; Gardiner; Mammoth; vicinity of Rustic Falls; near Fountain Geyser.

31. FIRMLEAF WILLOW, FALSE MYRTLE WILLOW (*Salix pseudocordata* (Anderss.) Rybd.).—Low shrub often found growing in dense thickets in wet meadows or bogs; leaves lance-shaped, smooth, thick and firm, the margin finely toothed; catkins leafy-bracted at base, appearing with the leaves; scales brownish; stamens 2, the filaments distinct, smooth; capsules smooth, on stalks 1 to 1 1/2 mm. long, the styles 1/2 to 3/4 mm. long. (Syn. *Salix pseudomyrsinites* Anderss., in part.)

Occurrence.—CRATER LAKE: near west boundary of park; Boundary Spring; Sand Creek. LASSEN: Summit Lake, 6,950 feet. KINGS CANYON: Harrison Pass trail. SEQUOIA: south end of Crescent Meadow; between Little Five Lakes and Kaweah Gap. GLACIER: Blackfeet Highway near Two-Medicine Ridge. YELLOWSTONE: Tower Falls; Swan Lake; Cooke City road. ROCKY MOUNTAIN: Bear Lake; Grand Lake. BRYCE CANYON.

32. YELLOW WILLOW (*Salix lutea* Nutt.).—Erect shrub 6 to 12 feet

high with stems clustered at base; branchlets yellowish; leaves narrowly egg-shaped to narrowly lance-shaped, 1½ to 3½ inches long, thinnish, yellow-green above, whitish below, the margins finely toothed or not toothed; catkins scarcely stalked, leafy-bracted at base, appearing with the leaves; scales brownish, thinly hairy; stamens 2, the filaments distinct, not hairy; capsules smooth, on short stalks ¾ to 2 mm. long, the style less than ½ mm. long. Syns. *S. Watsoni* Rydb., *S. cordata* Muhl. var. *lutea* (Nutt.) Bebb).

Occurrence.—ROCKY MOUNTAIN. BRYCE CANYON. ZION.

33. GREENSIDES WILLOW (*Salix monochroma* Ball).—Much-branched shrub or tree sometimes 20 feet high; branchlets reddish or olive, smooth and shiny; leaves dark green, reverse-egg-shaped to broadly lance-shaped, rounded or heart-shaped at base, about 3 inches long, thinnish, the margins finely toothed; catkins leafy-bracted at base, appearing with the leaves; scales brownish, silky-hairy; stamens 2, the filaments smooth, joined at base; capsules smooth, on stalks about 3 to 4 mm. long, the styles less than 1 mm. long. This species furnishes excellent browse for animals. (Syn. *S. pyrifolia* of Coulter & Nelson, Man. Rocky Mtn. Bot., not Anderss.)

Occurrence.—GLACIER. YELLOWSTONE: Stevenson's Island in Yellowstone Lake.

34. BALSAM WILLOW (*Salix pyrifolia* Anderss.).—Much-branched shrub or sometimes a small tree with shiny reddish or olive twigs; leaves short-oval to oblong-lance-shaped, rounded or heart-shaped at base, thinnish, dark green above, paler or whitish below, slightly glandular-toothed; catkins leafy-bracted at base, appearing with the leaves; fruiting catkins very lax; scales persistent, rather light, colored at the tips; stamens 2, the filaments smooth, distinct; capsules smooth, distinctly pedicelled, the style short. (Syn. *S. balsamifera* Barr.).

Occurrence.—ISLE ROYALE, common: Mott Island; Scoville Point; Raspberry Island.

35. SILKY-BACK WILLOW (*Salix vestita* Pursh).—Low shrub with ascending stems ½ to 4 feet high; leaves 1 to 2 inches long, broadly elliptic to roundish, thickish, dark green and strongly veined above, densely covered below with long white hairs, the margins not toothed; catkins appearing after the leaves, on leafy stalks; stamens 2, the filaments distinct, hairy below; capsules hairy, the style none.

Occurrence.—GLACIER, common, 5,500 to 6,500 feet; Hanging Gardens below Logan Pass; switchbacks below Swiftcurrent Pass; upper trail to Grinnell Glacier; Brown Pass; switchbacks above Stoney Indian Lake; Hidden Canyon on side of Bear Hat Mountain; Gunsight Pass.

35a. (Var. *erecta* Anders.).—Similar to the species but the plants more erect; leaves narrower, more pointed; plants often forming large dense patches. (Syn. *S. Fernaldi* Blankinsh.)

Occurrence.—GLACIER: Skyline trail to Granite Park, about 6,500 feet.

36. SCOULER WILLOW (*Salix Scouleriana* Barr.).—Many-stemmed shrub or small tree, 3 to 15 feet high, commonly occurring on dry open slopes in

the forest and frequently becoming abundant in burned areas; leaves reverse-egg-shaped to reverse-lance-shaped, rounded or abruptly pointed at the tips, 1¼ to 4 inches long, green above, pale to whitish or silky-hairy below, the margins not toothed or scarcely so; catkins oblong to elliptic, ½ to 1 inch long, appearing before the leaves, stout; scales black, hairy; stamens 2, long-exserted, the filaments smooth; capsules finely white-hairy, the styles none. (Syn. *S. Nuttalli* Sarg.)

Occurrence.—OLYMPIC, abundant: Elwha River; Enchanted Valley above the chalet; Seven Lakes Basin. MOUNT RAINIER, abundant, 2,000 to 5,000 feet. CRATER LAKE. YOSEMITE, 5,000 to 7,000 feet: Glacier Point; Wawona. KINGS CANYON: Junction Meadow and below. SEQUOIA 7,000 to 9,000 feet: south end of Crescent Meadow; Cliff Creek; Mineral King; below Twin Lakes. GLACIER, abundant, 3,000 to 5,000 feet: Belton; flats below Lake McDonald; Going-to-the-Sun Highway; Blackfeet Highway. YELLOWSTONE, rare: Cooke City road. GRAND TETON: Granite Canyon. POCKY MOUNTAIN, common, 8,500 to 10,000 feet. ZION. GRAND CANYON.

37. PRAIRIE WILLOW (*Sal.x humilis* March).—Shrub 3 to 10 feet high with many stems from the base; leaves oblong-lance-shaped to reverse lance-shaped, 2 to 6 inches long, becoming smooth above, whitish and softly hairy below, the margins wavy but not toothed, more or less rolled in at the edges; catkins egg-shaped to elliptic, ½ to 1½ inches long, naked at the base, appearing before the leaves, often recurved; scales persistent, dark-colored; stamens 2, the filaments smooth; capsules hairy, borne on short stalks, the styles short or none.

Occurrence.—ISLE ROYALE, common: Mott Island; near Scoville Point.

38. PUSSY WILLOW (*Salix discolor* Muhl.).—Large shrub or small tree found in low meadows, along streams, or around margins of lakes or swamps; leaves elliptic-oblong to reverse-lance-shaped, smooth and bright green above, covered with a whitish bloom below, irregularly toothed or nearly entire, pointed at both ends, 1¾ to 4 inches long; catkins cylindric, 1 to 3 inches long, naked at base, appearing before the leaves; scales dark red, brown, or blackish, densely covered with long glossy hairs; stamens 2, the filaments smooth, distinct; anthers yellow; capsules finely hairy, the styles short but distinct.

Occurrence.—ISLE ROYALE: Washington Harbor; near Scoville Point.

39. PLANELEAF WILLOW (*Salix planifolia* Pursh).—Low, almost prostrate plant 6 inches high or erect shrub 3 feet (or rarely 8 feet) high, forming large clumps; branchlets brown or purplish, smooth and shining, or sometimes covered with a whitish bloom; leaves egg-shaped to oblong or reverse-egg-shaped, ½ to 2½ inches long, smooth and bright green above, paler below or often whitish, the margins not toothed, or with a few fine teeth, becoming somewhat leathery; catkins appearing with the leaves, not stalked, often with a few leafy bracts at base; scales brownish to nearly black, hairy; stamens 2, the filaments distinct, smooth; capsules hairy, not stalked, the styles 1 mm. or more long. (Syns. *S. planifolia* Pursh var. *Nelsoni* Ball, *S. chlorophylla* of our area, *S. monica* Bebb., *S. phylicifolia* of Am. authors.)

Occurrence.—YOSEMITE, 7,500 to 11,500 feet: Mono Pass; below Mount Dana saddle; Dana Meadows; Vogelsang Pass; upper Gaylor Lake; Tuolumne Meadows; Rancheria Mountain. YELLOWSTONE: Lake; Old Faithful. ROCKY MOUNTAIN, 7,500 to 11,500 feet: near Poudre Lakes; Fall River road; Trail Ridge. ISLE ROYALE: head of Siskowit Bay; Gull Islands.

FEATHERVEIN WILLOW (*Salix pennata* Ball), recorded from Mount Rainier, is very close to the variable *S. planifolia.*

40. LEMMON WILLOW (*Salix Lemmoni* Bebb.).—Many-stemmed shrub 3 to 12 feet high, the branchlets yellowish-green to brownish, shining or often with a bluish bloom; leaves lance-shaped or elliptic-lance-shaped to reverse-lance-shaped, 1½ to 4 inches long, dark green and smooth above when mature, paler or somewhat whitish below, the margins mostly not toothed; catkins appearing with the leaves, ½ to 1 inch long, borne on short leafy stalks; scales brown or black, hairy; capsules silky-hairy, the pedicels 1½ to 2 mm. long, the styles very short or nearly none.

Occurrence.—CRATER LAKE: Copeland Creek above the beaver dams; Annie Creek. LASSEN: highway east of Mineral. YOSEMITE, 5,000 to 9,000 feet: Glacier Point; Fletcher Lake; Vogelsang Pass; Ireland Lake trail; Donohue Pass; Tuolumne Meadows; Lake Tenaya; Crane Flat. KINGS CANYON: East Lake; near Junction Meadow. SEQUOIA, 7,000 to 8,500 feet: south end of Crescent Meadow; Alta Peak trail; Alta Meadows; Twin Lakes; Little Willows Meadow.

41. BLUE WILLOW (*Salix subcoerulea* Piper).—Branchlets hoary with a dense white bloom; leaves narrowly to broadly oblong-lance-shaped to reverse-lance-shaped, 1½ to 2 or 3 inches long, 1/3 to 1 inch wide, silvery below with short dense hairs; catkins appearing with the leaves, naked or with few bracts at base; scales brown to black; stamens 2, the filaments distinct, smooth; capsules hairy, on stalks 1 mm. long or scarcely stalked, the styles evident, 1 to 1½ mm. long. (Syn. *S. Covillei* Eastw.).

Occurrence.—KINGS CANYON, 7,500 to 9,600 feet: East Lake. SEQUOIA: Mineral King. GLACIER: Anaconda Creek; Park Creek; near park headquarters; Going-to-the-Sun Highway above Lake McDonald; Blackfeet Highway overlooking Lower Two-Medicine Lake. YELLOWSTONE: meadows at Lake; along Madison River; Mammoth. GRAND TETON: eastern park boundary near Moose. ROCKY MOUNTAIN, common, 7,500 to 9,000 feet. BRYCE CANYON. ZION.

BEAUTIFUL WILLOW (*Salix bella* Piper), a species similar to blue willow but with the hairs of the leaves and scales longer and denser, is listed by C. R. Ball from Flathead County in Glacier National Park.

42. DRUMMOND WILLOW (*Salix Drummondiana* Barr.).—Shrubs 3 to 10 feet high with smooth shiny dark brown branches, the younger branchlets yellowish and somewhat hairy or woolly; leaves broadly oblong to oval or reverse-egg-shaped, 1 to 3 inches long, not toothed or sparingly toothed near the blunt tips, green above, whitish below with fine lustrous hairs; catkins dense, appearing with the leaves, naked or with few bracts at base, not stalked or scarcely so; stamens 2, the filaments smooth, distinct; capsules silvery-

woolly, on stalks ½ to 1½ mm. long, the styles ½ to 1 mm. long. Found at low and middle altitudes.

Occurrence.—GLACIER.

43. SITKA WILLOW (*Salix sitchensis* Sans.).—Erect shrub or small tree 6 to 18 feet high, usually growing along streams; branchlets slender, smooth; leaves oblong-reverse-egg-shaped to reverse-lance-shaped, 2 to 5 inches long, silvery-hairy below, the margins not toothed; catkins appearing with the leaves; scales brown, thinly and softly hairy; stamen 1, the filament not hairy, the anthers purple; capsules silky-hairy, the styles ½ to ¾ mm. long.

Occurrence.—OLYMPIC, 580 to 5,000 feet; Lake Crescent; Elwha River near mouth of Godkin Creek; Boulder Creek above Olympic Hot Springs; southeast of Mount Anderson; Mount Hopper. MOUNT RAINIER, common. CRATER LAKE, occasional: Llao's Hallway. YOSEMITE, 6,500 to 8,500 feet: Illilouette Creek.

44. COULTER WILLOW (*Salix Coulteri* Anderss.).—Similar to Sitka willow but the branchlets stoutish, finely hairy; leaves densely white-hairy below; scales tawny, densely white-hairy; anthers yellow; capsules silky-hairy. (Syn. *S. sitchensis* Sans. var. *Coulteri* Jepson.)

Occurrence.—OLYMPIC. MOUNT RAINIER. CRATER LAKE: near west shore of Wizard Island.

45. JEPSON WILLOW (*Salix Jepsoni* Schn.).—Shrub 3 to 6 feet high; branchlets smooth, reddish-brown; leaves narrowly reverse-lance-shaped, usually with blunt-pointed tips, 1 to 4½ inches long, densely silky-hairy below; catkins appearing with the leaves, borne on short leafy stalks; scales brown, densely hairy; stamens 2, the filaments not hairy; capsules densely silky-hairy, on stalks about 1 mm. long, the style evident, about 0.7 to 1 mm. long. (Syn. *S. sitchensis* Sans. var. *angustifolia* Bebb.)

Fig. 10. Sageleaf willow (*Salix candida*).

Occurrence.—YOSEMITE, 6,500 to 9,500 feet: west of Lake Tenaya; Illilouette Creek; Tioga road along Tuolumne River. SEQUOIA: Merten Creek below Merten Meadow, 9,200 feet.

46. SAGELEAF WILLOW (*Salix candida* Fluegge), fig. 10.—Shrub 1 to 3 feet high; young twigs white-woolly, the older stems smooth, red; leaves linear to oblong, or narrowly reverse-lance-shaped, 1¼ to 3 inches long, rather stiffish, densely white-woolly below, thinly so above, the margins often inrolled; catkins appearing with the leaves, borne on short leafy stalks; scales dark, persistent; stamens 2, the filaments smooth, the anthers red; capsules white-

woolly, short-stalked, the styles reddish, 1 to 1½ mm. long. This species forms thickets in bogs.

Occurrence.—GLACIER, common, 4,500 to 7,000 feet: below Swiftcurrent Lake; Indian Pass trail above Glenns Lake; Otokomi Lake; head of Red Eagle valley; Going-to-the-Sun Highway above Avalanche campgrounds; Blackfeet Highway overlooking Lower Two-Medicine Lake.

47. SATINY WILLOW (*Salix pellita* Anderss.).—Large shrubs or sometimes a small tree; branchlets dark brown or olive; leaves linear-lance-shaped to reverse-lance-shaped, 2 to 5 inches long, smooth above, white-velvety below, especially when young, the margins sometimes irregularly scalloped, but not toothed; catkins leafy-bracted at base, appearing with the leaves; stamens 2, the filaments smooth, distinct; capsules densely white-hairy, short-stalked, the styles yellowish.

Occurrence.—Reported from ISLE ROYALE by W. S. Cooper.

BIRCH FAMILY (Betulaceae)

FIELD GUIDE TO THE GENERA

Fruits borne in small cone-like structures.

- Leaf blades 1/3 to 2 inches long; cones oblong, borne singly, composed of thin papery scales, falling to pieces on the tree ..... BETULA, p. 55.
- Leaf-blades 1½ to 4 inches long; cones oval, borne in clusters of several, composed of small thickish woody scales, not falling to pieces on tree..... ALNUS, p. 57.

Fruits not borne in cone-like structures.

- Fruits hard-shelled nuts (hazelnuts), each enclosed by a hairy sheath-like involucre which extends beyond the nut as a fringed tube; male and female flowers borne on the same plants; occurs in Pacific Coast parks ..... CORYLUS, p. 59.
- Fruits small nutlets, each surrounded by a loose, papery, bladder-like sac, these clustered at the ends of short stems; male and female flowers borne on different plants; occurs in Grand Canyon National Park .... OSTRYA, p. 60.

BIRCH (*Betula* L.)

The birches are commonly found along streams or in moist locations in our national parks. The tree species are most conspicuous, especially in the northern parks, but shrubby species are also common, particularly in the Rocky Mountains. Birch flowers are borne in slender catkins. The fruits are seed-like nutlets, mostly winged on the sides. They fall with their scales from the axis of the catkins when mature.

FIELD GUIDE TO THE SPECIES

Leaves thinnish, egg-shaped, 1 to 2 inches long, pointed at the tips, irregularly double-toothed with pointed teeth; wings of fruits broader than nutlets; tall shrubs or small trees ..... 1. *B. fontinalis.*

Leaves thickish, roundish to reverse-egg-shaped or wedge-shaped, 1/3 to 1½ inches long, the margins with coarse blunt teeth; wings of fruits mostly narrower than nutlets or nearly lacking; shrubs.

Leaves reverse-egg-shaped to wedge-shaped, green and smooth on both sides; western species found in Rocky Mountain parks .....2. *B. glandulosa.*

Leaves reverse-egg-shaped to round or kidney-shaped, green above, paler and glandular below; eastern species reported from Isle Royale ....3. *B. pumila* var. *glandulifera.*

Fig. 11. Water birch (*Betula fontinalis*).

1. WATER BIRCH, MOUNTAIN BIRCH (*Betula fontinalis* Sarg.), fig. 11.—Tall spreading shrub or slender graceful tree with open crown; branches slender, the twigs covered with shiny resinous dots; bark reddish, not breaking into bands or "curls" as in paper birch; leaves thin, oval to roundish, ¾ to 2 inches long, pointed at the tip, the margins toothed, turning a beautiful clear yellow in the Fall; flowers and fruits borne in small slender catkins or cones about 1 to 1½ inches long, the scales falling away when the seeds are ripe; fruits tiny seed-like nutlets with broad thin wings. Water birch is also called red birch, black birch, or sweet birch. It is commonly found along streams or around springs.

Occurrence.—KINGS CANYON: between Junction Meadow and Charlotte Creek. GLACIER, occasional: along creek near outlet of St. Mary Lake; Red Eagle Valley; shore of St. Mary Lake near East Glacier Campgrounds. YELLOWSTONE, 6,500 to 7,500 feet: along Boiling River; near Firehole bridge. ROCKY MOUNTAIN, occasional. BRYCE CANYON: near water fountain, Peek-a-boo trail. ZION, occasional 4,500 to 6,500 feet: trail from Lodge to Birch Creek; Weeping Rock; Emerald Pools; Grotto; west rim ranger cabin. GRAND CANYON. North Rim: Bright Angel Spring; around the springs in South Big Spring Canyon; near Kanabownitz Spring. Canyon, rare, north of the Colorado River: Ribbon Falls, near Kaibab trail, 3,750 feet.

2. BOG BIRCH (*Betula glandulosa* Mich.), fig. 12.—Spreading shrub, 1 to 8 feet high, branches dark reddish-brown, young twigs sticky, more or less resinous; leaves small, roundish to reverse-egg-shaped with rounded tips and toothed margins, smooth, 1/3 to 1 inch long; cones 1/3 to ¾ inch long. This species is also known as scrub birch.

Occurrence.—GLACIER, occasional 5,000 to 7,500 feet: Garden Wall trail to Granite Park; Swiftcurrent Lake near Many Glacier Hotel; north of Lake Janet; Gunsight Pass; head of St. Mary Lake. YELLOWSTONE, occasional: south of Old Faithful; near Firehole Bridge; along Boiling River near north entrance; near Rustic Falls, between

Mammoth and Norris Junction. GRAND TETON, occasional: head of Death Canyon; North Fork Cascade Canyon, 8,000 feet. ROCKY MOUNTAIN, common, 8,000 to 11,000 feet; southwest of Mount Bryant; Moraine Park.

3. LOW BIRCH (*Betula pumila* L. var. *glandulifera* Regel.).—Spreading shrub 1½ to 9 feet high with somewhat resinous or gland-dotted twigs and foliage; leaves thickish, reverse-egg-shaped to round or kidney-shaped, ½ to 1¼ inches long; fruiting catkins ¼ to 1¼ inches long.

Occurrence.—ISLE ROYALE, rare: bog on Raspberry Island.

Fig. 12. Bog birch (*Betula glandulosa*).

ALDER (*Alnus* Hill)

The shrub species of alder found in our national parks, like the tree species, are common along streams or in moist meadows. They are important along stream banks as protection against erosion. The plants spread by suckers and underground stems and frequently form extensive thickets so dense that they are practically impenetrable. During the winter in regions of heavy snow the stems may be bent to the ground. Beaver cut the stems of alders for building their dams and houses and strip the bark from the branches for food. The twigs furnish important winter forage for deer and elk. The Blackfeet Indians used the tough bark covered with rawhide for making stirrups.[12] Nitrogen-fixing bacteria form nodules on the roots of alders in somewhat the same manner as on the roots of members of the pea family.

FIELD GUIDE TO THE SPECIES

Leaves rather coarsely double-toothed; flowers developing before the leaves; cones borne on short stoutish stalks; nutlets not winged or very narrowly winged.

Western species ..... 1. *A. tenuifolia.*

Eastern species ..... 2. *A. incana.*

Leaves finely and sharply toothed; flowers developing with the leaves; cones borne on slender stalks usually as long as the cones or longer; nutlets with conspicuous thin wings.

Western species ..... 3. *A. sinuata.*

Eastern species ..... 4. *A. crispa.*

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12 Standley, P. C., Flora of Glacier National Park. Contributions from the United States National Herbarium, vol. 23: 5. 1921.

1. THINLEAF ALDER, MOUNTAIN ALDER (*Alnus tenuifolia* Nutt.), fig. 13.—Shrub 6 to 15 feet high or sometimes a tree 20 to 25 feet high; bark smooth, thin, grayish-brown; leaves egg-shaped, bluntly pointed at the tip, 1½ to 4 inches long, the margins coarsely toothed or somewhat lobed and again toothed, dark green and frequently gummy above, paler below; male flowers borne in long pendent clusters 1 to 3 inches long, appearing before the leaves; cones about 1/3 to ½ inch long, brown when ripe, borne in clusters of several near the ends of the branches; fruits small seedlike nutlets with narrowly winged margins.

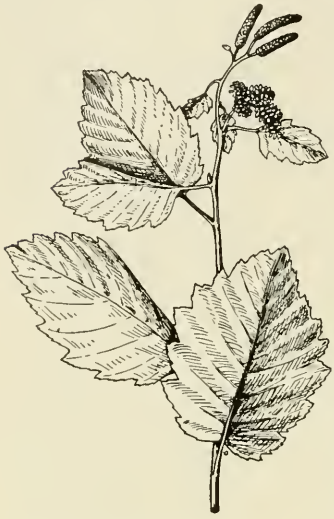

Fig. 13. Thinleaf alder (*Alnus tenuifolia*).

Occurrence.—CRATER LAKE, occasional, 5,800 to 6,250 feet: Annie Creek at south entrance. LASSEN, occasional. GLACIER, abundant along streams, 3,100 to 5,000 feet: along Middle Fork of Flathead River at Belton; Lake McDonald; St. Mary Lake near East Glacier Campgrounds. YELLOWSTONE, occasional: near east entrance; Tower Creek; Gardiner River; Yellowstone River. GRAND TETON, occasional, 6,000 to 8,500 feet. ROCKY MOUNTAIN, common along streams: Big Thompson Canyon, 7,000 feet. MESA VERDE.

2. SPECKLED ALDER (*Alnus incana* (*L.*) Moench.).—Tall shrub or small tree up to about 15 feet high; leaves broadly elliptic to egg-shaped, rather coarsely double-toothed, dark green above with impressed veins, rusty or whitish below and somewhat downy, at least on the veins; fertile catkins borne on short stout stalks, coming from naked buds formed the previous season, the flowers developing before the leaves; seed-like fruits wingless or with merely a narrow leathery margin. This is the species commonly found in swamps and along streams.

Occurrence.—ISLE ROYALE, common: Mott Island.

3. SITKA ALDER (*Alnus sinuata* (Regel.) Rydb.), fig. 14.—Similar to mountain alder but the leaves finely toothed and not, or scarcely, lobed;

Fig. 14. Sitka alder (*Alnus sinuata*).

flowers appearing with the leaves; cones with at least some of the stems as long as or longer than the cones; fruits with conspicuous winged margins almost as wide as the nutlet. (Syn. *A. viridis* var. *sinuata* Regel., *A., sitchensis* Sarg.)

Occurrence.—OLYMPIC, abundant, 1,000 to 5,000 feet: Mount Angeles; lower slopes of Mount Seattle above Low Divide; Duckabush River. MOUNT RAINIER, abundant, 2,500 to 5,000 feet: near head of Stevens Canyon; Nisqually Valley. CRATER LAKE: Government Camp; south shore Crater Lake. GLACIER, abundant, 4,500 to 7,500 feet: Going-to-the-Sun Highway west of Logan Pass; Swiftcurrent Lake and Valley; trail to Iceberg Lake; Mineral Creek at Cattle Queen snowshoe cabin; Gunsight Lake; East Glacier Campground.

4. AMERICAN GREEN ALDER (*Alnus crispa* (Ait.) Pursh.).—Tall shrub; leaves round-oval to egg-shaped or slightly heart-shaped, 1 to 2½ inches long, glutinous, smooth on both sides or slightly hairy on the main veins below, finely and irregularly toothed; flowers developing with the leaves; fertile catkins from scale-covered buds, slender-stalked; seed-like fruits with thin conspicuous wings. This species is generally found at the margins of lakes and bays or along streams. (Syn. *A. viridis* of American authors.)

Occurrence.—ISLE ROYALE, common: Mott Island; Rock Harbor Lighthouse; Washington Harbor.

BEAKED FILBERT, HAZELNUT (*Corylus rostrata* Ait.) and CALIFORNIA FILBERT, CALIFORNIA HAZEL (Var. *californica* A. DC.), fig. 15.—Many-stemmed shrubs 3 to 10 feet high, or sometimes small trees, particularly in the Pacific coast form; leaves egg-shaped to roundish with pointed or rounded tips, 1½ to 4 inches long, irregularly toothed, thinnish, softly hairy and velvety to the touch; nuts round to oval, about ½ inch in diameter, each surrounded by an involucral sheath contracted at the tip of the nut and prolonged into a fringed tube ½ to 1¼ inches long. (Syn. *C. cornuta* March).

Beaked filbert occurs commonly in forest openings along streams or on moist slopes. The flowers appear in the spring before the leaves, the male or staminate in slender drooping catkins similar to those of birch or alder, and the female flowers in tiny bud-like structures. The fruits are nuts similar to the commercial filberts, but with the bracts surrounding the nut prolonged into a conspicuous beak. They are usually borne in pairs with the beaks pointing opposite each other. The nuts, which are of good flavor, were collected by the Indians and stored for winter use. The Indians of California also used the two- and three-year-old shoots for the ribs of baskets.[13] The foliage is browsed by deer and moose.

Occurrence (*C. rostrata*).—ISLE ROYALE, abundant over most of the island, but heavily browsed by moose: Washington Harbor; Lake Richie; Daisy Farm; slopes of Greenstone Ridge.

Occurrence (Var. *californica*).—OLYMPIC. MOUNT RAINIER, rare: trail below Narada Falls; single small specimen found near Ohanapecosh Hot Springs. CRATER LAKE, rare at the lower elevations: lower Annie Creek; lower Redblanket canyon; south slope Crescent Ridge. YOSEMITE, occasional: northeast of Alder Creek ranger station; Yosemite Valley; Mariposa Grove; Moss Creek. SEQUOIA, occasional along streams and

13 Jepson, W. L., Flora of California, vol. 1: 350. 1909.

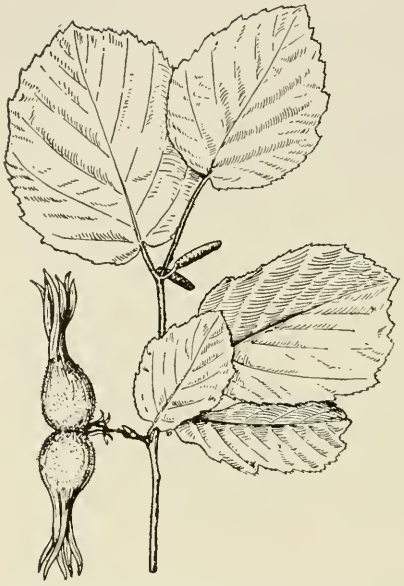

Fig. 15. California filbert (*Corylus rostrata* var. *californica*).

Fig. 16. Knowlton hophornbeam (*Ostrya Knowltoni*).

in moist wooded sections, 3,500 to 7,500 feet: Clough Cave; east of Colony Peak; Tocopah Falls; Bearpaw Meadow.

KNOWLTON HOPHORNBEAM (*Ostrya Knowltoni* Cov.), fig. 16.—Shrubs, or slender trees up to 12 feet high, with ashy-gray bark; leaves egg-shaped to elliptic, pointed or rounded at the tips, 1 to 2 inches long, soft-hairy below, the margins sharply double-toothed; flowers appearing with the leaves, the staminate in slender drooping catkins, the seed-bearing in small inconspicuous clusters; fruits small nutlets, each enclosed by a yellow-green or straw-colored bladdery sac and forming clusters similar to that of the hop.

Hophornbeam might easily be mistaken for a birch or for beaked filbert by one unfamiliar with the genus, but the fruits are entirely different. They are small flattened nutlets, each surrounded by a loose, papery, bladder-like sac. These are clustered into small heads at the ends of short nodding stems. Like the birches, the foliage turns yellow in the autumn.

Occurrence.—GRAND CANYON, occasional in the canyon, 4,500 to 7,000 feet: Kaibab trail 1½ miles below Yaki Point; Roaring Springs canyon; Bright Angel trail.

AMERICAN HOPHORNBEAM (*Ostrya virginiana* (Mill.) Koch.) is reported from Greenstone Ridge on Isle Royale. This differs from Knowlton hophornbeam in being in general larger with long-pointed leaves 2½ to 4 inches long and with the fruit clusters larger.

OAK FAMILY (Fagaceae)

FIELD GUIDE TO THE GENERA

Fruit a spiny bur containing 1 to 3 nuts ..... CASTANOPSIS, p. 61.
Fruit an acorn composed of a single nut set in a scaly cup-like involucre ..... QUERCUS, p. 62.

CHINQUAPIN (*Castanopsis* Spach.)

The chinquapins are evergreen shrubs especially interesting because of their spiny bur-like fruits which resemble chestnuts. Sierra Chinquapin is common in the parks of the Sierra Nevada, usually forming thickets on dry ridges or in openings in the forest, the nuts are a favorite food of squirrels and are gathered as soon as they are ripe. Both species send up stump sprouts after a brush fire.

FIELD GUIDE TO THE SPECIES

Round-topped shrubs; leaves blunt at the tips, mostly flat. ..... 1. *C. sempervirens.*
Erect shrubs or small trees; leaves long-pointed, trough-like due to upturned margins ..... 2. *C. chrysophylla.*

1. CALIFORNIA CHINQUAPIN, SIERRA CHINQUAPIN (*Castanopsis sempervirens* Dudl.).—Evergreen shrub 1 to 8 feet high with branches spreading from the base; bark brown and smooth; leaves thick and leathery, dark green above, with a golden or light yellowish-green fuzz below, 1 to 3 inches

Fig. 17. Golden chinquapin (*Castanopsis chrysophylla*).

long, ⅜ to 1¾ inches wide; flowers tiny, without petals, borne in slender clusters at the ends of the branches; nuts brown, 1 to 3 in a spiny bur-like covering similar to the chestnut bur; the spines slender, stiff, often ½ inch long.

Occurrence.—CRATER LAKE, common in the ponderosa pine woods: slopes around Crater Lake; Union Peak. LASSEN: Drakesbad, 5,000 feet; lower Loop Highway. YOSEMITE, common, 5,500 to 6,500 feet: Crane Flat road; 4½ miles northwest of El Portal; Illilouette Creek. KINGS CANYON: Ouzel Basin. SEQUOIA, common, 6,000 to 8,500 feet: trail to Alta Peak; ridge east of Panther Peak; ½ mile west of Little Baldy; west side of Black Rock Pass; near Quinn ranger station.

2. GOLDEN CHINQUAPIN, GIANT CHINQUAPIN (*Castanopsis chrysophylla* (Dougl.) DC.), fig. 17.—Similar to California Chinquapin, but the plants more erect and usually tree-like, often thicket-forming; leaves more pointed, folded and trough-like.

Occurrence.—OLYMPIC: occurs along Hood Canal east of park. CRATER LAKE, rare: lower Redblanket Canyon near southwest corner of park.

OAK (*Quercus* L.)

The oaks, among the best known of the western woody plants, are easily recognized by their characteristic acorn fruit which consists of a leathery-shelled nut set in a scaly cup-like involucre. The nuts, which are very nutritious, are eaten by many forms of wildlife such as squirrels, grouse, woodpeckers, deer and bear. They were also a valuable source of food for the Indians who gathered and stored them for winter use. The kernels were prepared by grinding them into meal and leaching out the tannin with water. The meal was then made into bread or mush, furnishing in many localities the chief winter food. The leaves of certain of the species, particularly of the large-leaved white oaks, furnish good forage for deer.

The group as a whole may be divided into two sections, the white oaks and the black. The latter are ordinarily evergreen, with usually dark colored bark. The leaves are thickish and often spine-toothed, and the acorns do not usually mature until the second year. The white oaks, on the other hand, are not evergreen, the bark is usually light colored, the leaves without prickles, and the acorns require only one year to mature. As a rule the white oaks furnish better forage for animals and the acorns are sweeter and more palatable.

FIELD GUIDE TO THE SPECIES

Leaves 2 to 5 inches long, shiny green above, deeply and coarsely toothed, or lobed to the middle, the lobes or teeth rounded. (White Oaks).

Leaves dull green below, at first finely hairy, becoming smooth; occurs in parks of the Southwest ..... 1. *Q. Gambeli.*

Leaves grayish or rusty and often softly hairy below; occurs in Pacific slope parks ..... 2. *Q. Garryana* var.

Leaves ¼ to 2 inches long, the margins toothed (often spine-toothed) or not toothed, often wavy or crisped (Black Oaks).

Leaves pale or rusty-yellowish below with fine hairs.
Leaves mostly not toothed; occurs in California parks ..... 3. *Q. vaccinifolia.*

Leaves mostly spine-toothed; occurs in parks of the Southwest .....
.....4. *Q. dumosa.*

Leaves green above and below, not grayish- or yellowish-fuzzy below.

Leaves toothed, the margins not crisped, the teeth not spine-tipped .....
.....5. *Q. undulata.*

Leaves spine-toothed or not toothed.

Leaf-margins strongly crisped, spine-toothed; occurs in parks in the Southwest .....5a. Var. *pungens.*

Leaf-margins scarcely if at all crisped, spine-toothed or not toothed; occurs in Sequoia National Park .....6. *Q. Wislizeni* var.

1. GAMBEL OAK (*Quercus Gambeli* Nutt.), fig. 18.—Usually a tall many-stemmed shrub 10 to 20 feet high, the young twigs fuzzy, light brown; leaves about 3 to 5 inches long, 1 to 3 inches wide, tapering towards the base, rounded at the tips, deeply divided into several more or less rounded lobes, shiny green above, duller below, at first often finely hairy, later becoming smooth; acorns egg-shaped to oblong, more or less pointed at the tips, about ½ inch long, ¾ to ⅝ inch wide, light brown to nearly black; cup hemispheric or somewhat top-shaped, covering 1/3 to ½ of the acorn, the scales rounded and somewhat thickened on the backs, mostly united at the base, the tips free, pointed. (Syn. *Q. Gunnisoni* Rydb.)

Fig. 18. Gambel oak (*Quercus Gambeli*).

Gambel oak is similar in appearance to Rocky Mountain white oak, which is ordinarily a tree. The two species are common in many parks of the Southwest where they are often found growing together. They cover large areas in Mesa Verde National Park, forming dense thickets on hillsides. The foliage is browsed by deer. During the Fall the leaves turn red and orange and are among the most colorful of the autumn shades.

Occurrence.—MESA VERDE, abundant on the hillslopes in the northern part of the park: along highway below Park Point. BRYCE CANYON: along rim drive between Bryce Point and Farview. ZION, occasional, 4,000 to 8,000 feet: canyon walls near west entrance; the Narrows trail; vicinity of Mirror Lake. GRAND CANYON, 6,000 to 8,000 feet. North Rim, common: McKinnon Point; near Grand Canyon Lodge. South Rim, abundant in openings in the ponderosa pine forest: rim drives; Yaki Point; west of Moran Point. Canyon, common above 6,000 feet below both rims: Bright Angel trail; Kaibab trail above Roaring Springs.

Fig. 19. Kaweah oak (*Quercus Garryana* var. *Breweri*).

2. KAWEAH OAK, BREWER OAK (*Quercus Garryana* Dougl. var. *Breweri* Jepson), fig. 19.—Widely spreading shrub 3 to 15 feet high; bark smooth, gray; leaves oblong to oval, 2 to 4 inches long, divided to near the midrib into several broad rounded lobes, shiny green above, pale or rusty below and often softly hairy; acorns oval to roundish, 3/4 to 1 1/4 inches long, the cup shallow. (Syn. *Q. Garryana* var. *semota* Jepson.)

This species often forms pure dense stands in openings in the forest or on mountain slopes, especially in the chaparral belt of Sequoia National Park. The foliage is browsed by deer and the large acorns are taken by small mammals. They are very nutritious, a fact recognized by the Indians of the region, who gathered them and stored them for winter food.

Occurrence.—CRATER LAKE, rare: southwest corner of park, 5,450 feet. SEQUOIA, common, 3,000 to 5,600 feet: Middle Fork Kaweah River; east of Panther Creek; east of Clough Cave; North Fork Kaweah River trail.

3. HUCKLEBERRY OAK (*Quercus vaccinifolia* Kell.).—Low evergreen shrub, 1 to 6 feet high, the slender branchlets crowded and broomlike near the ends of the stems; leaves oblong to narrowly egg-shaped, 1/2 to 1 1/4 inches long, dull gray-green above, paler and finely hairy below; acorn roundish, pointed at the tip, 1/3 to 1/2 inch long, set in a rather shallow cup, the cup thinnish, hairy within.

This is a shrub of the higher mountains of California. As the common name implies, the plants resemble some of the western huckleberries. The

bushes may form extensive thickets on the mountain sides and act as valuable protection to the soil against erosion. The foliage is browsed by mule deer and the acorns are eaten by certain birds and small mammals.

Occurrence.—LASSEN, occasional. YOSEMITE, abundant, 5,000 to 9,000 feet: Ledge trail to Glacier Point; Four Mile trail; 2½ miles east of White Wolf; ¾ mile east of Gentry checking station. SEQUOIA, 7,000 to 10,000 feet: Sugar Bowl Dome.

4. SHRUB LIVE OAK, CALIFORNIA SCRUB OAK, CHAPPARRAL OAK (*Quercus dumosa* Nutt.), fig. 20.—Low evergreen shrub, 3 to 9 feet high or sometimes a small tree with stiff spreading branches; young twigs and leaves covered with fine hairs; leaves oblong to roundish, ¼ to 1 inch long, grayish-green above, paler or rusty-hairy below, conspicuously net-veined, the margins shallowly lobed or with spine-tipped teeth or not toothed; acorns slender, oblong, ½ to nearly 1 inch long, borne in clusters of 2 or 3, maturing the first autumn; cup rather shallow, top-shaped, gray. (Syn. *Q. turbinella* Greene.)

Fig. 20. Shrub live oak (*Quercus dumosa*).

The plants may occur singly or massed into low thickets. In spite of the tannin content of the herbage, this oak constitutes one of the valuable browse species of the genus, especially during dry seasons when other forage is scarce. The acorns were used to some extent by the Indians of the Southwest.

Occurrence.—MESA VERDE, rare. ZION, abundant, 2,250 to 5,000 feet: West Rim trail; Silver Reef mine. GRAND CANYON, 3,000 to 5,200 feet. North Rim: Powell Spring; McKinnon Point. South Rim: Bass Canyon. Canyon: Bright Angel Canyon; Kaibab trail a little below Cottonwood Camp; Santa Maria Spring.

5. SCRUB OAK, ROCKY MOUNTAIN SHIN OAK (*Quercus undulata* Torr.), fig. 21.—A small evergreen tree or spreading shrub with stout, more or less contorted stems; bark thin, scaly, pale gray, tinged with brown; leaves leathery, oblong, pointed at the tip or rarely rounded, 1 to 2 inches long, grayish-green, more or less hairy or scurfy when young, the margins toothed, the teeth rigid but not spine-tipped; acorns oval, rounded or slightly pointed at the tips, ¾ to 1 inch long, the cup hemispheric, thickish, light brown, finely hairy, with a fine fuzz on the inside, covering about 1/3 of the nut, the scales red-tipped. This species favors dry rocky ridges and slopes, often forming extensive thickets.

Occurrence.—ZION, 4,000 to 4,500 feet: canyon walls near south entrance; along

highway near Zion Tunnel; West Rim trail below Angels Landing; east of the Great White Throne; Lady Mountain; Potato Hollow; Pygmy Forest belt. GRAND CANYON, 4,000 to 7,000 feet, in the canyon: Bright Angel trail about 2½ miles below South Rim; Kaibab trail on the Tonto north of the Colorado River; Powell Saddle.

Fig. 21. Scrub oak (*Quercus undulata*).

5a. HOLLY OAK (Var. *pungens* Engelm.).—Similar to the species except the leaves usually somewhat smaller, spine-toothed and crisped along the margins. Holly oak favors dry rocky mountain slopes and ridges. (Syn. *Q. pungens* Liebm.)

Occurrence.—ZION, about 4,500 feet: Virgin River, especially in the southwestern part of the park; trail from Zion Lodge to Emerald Pools; the Narrows trail. GRAND CANYON in the canyon: north side of the Colorado River, 4,000 feet; Kaibab trail below Roaring Springs.

6. DWARF INTERIOR LIVE OAK (*Quercus Wislizeni* DC. var. extima Jepson).—Stiffly branched evergreen shrub, 3 to 8 feet high; leaves gray-green, oblong to egg-shaped, ¾ to 1½ inches long, stiff and brittle, smooth above and usually below, the margins not toothed or spine-toothed; acorns slender-cylindric, 2/3 to 1 inch long, maturing during the second summer.

Occurrence.—SEQUOIA, occasional: near junction of Milk Ranch road with Mineral King road.

SWEET-GALE FAMILY (Myricaceae)

WAX MYRTLE, SWEET-BAY (*Myrica* L.)

The wax myrtles are uncommon in the parks, occurring only rarely at the lower elevations in parks of the Pacific slope. They are usually good-sized shrubs with fragrant foliage and thickish, dark green, resin-dotted leaves. Inconspicuous flowers without petals are borne in oblong or cylindrical clusters, or catkins. Male and female flowers occur separately on the same or on different shrubs. The fruits are small seed-like nutlets.

FIELD GUIDE TO THE SPECIES

Leaves more or less hairy, especially below and on the margins, tapering at the base to a slender stalk ¼ to ⅜ inch long; nutlets not waxy-coated; occurs in Yosemite National Park ..... 1. *M. Hartwegi.*

Leaves mostly smooth, sometimes very finely hairy below, wedge-shaped at the base, tapering to a very short stalk; nutlets waxy-coated; occurs at Olympic and Isle Royale National Parks ..... 2. *M. gale.*

1. SIERRA SWEET-BAY (*Myrica Hartwegi* Wats.).—Much branched shrub, 3 to 5 feet high; leaves oblong to reverse-egg-shaped, 2 to 3½ inches long, the margins toothed; male flower clusters about 1 inch long, the seed-

bearing clusters very small, enlarging in fruit to about ½ inch long; fruits small nutlets enclosed by thickened bracts.

Occurrence.—YOSEMITE, 2,000 to 4,600 feet: South Fork Merced River; Merced Canyon near Arch Rock ranger station; Big Creek below Mariposa Grove.

2. WAX MYRTLE, SWEET-GALE (*Myrica gale* L.).—Similar to Sierra sweetbay but the leaf-blades with shorter stalks and the nutlets covered with a coat of wax.

Occurrence.—OLYMPIC: Lake Quinault. ISLE ROYALE, common along margins of lakes and bogs: Lake Richie; Hidden Lake; Scoville Point.

ELM FAMILY (Ulmaceae)

HACKBERRY, PALOBLANCO (*Celtis Douglasi* Planch.), fig. 22.—Usually a spreading shrub 8 to 15 feet high, or sometimes a small tree up to 30 feet high, with rounded crown and short trunk; bark ashy-gray, rough with prominent projecting ridges; leaves egg-shaped, somewhat heart-shaped and unequal-sided at the base, thick and leathery, 3-veined from the base, dark green

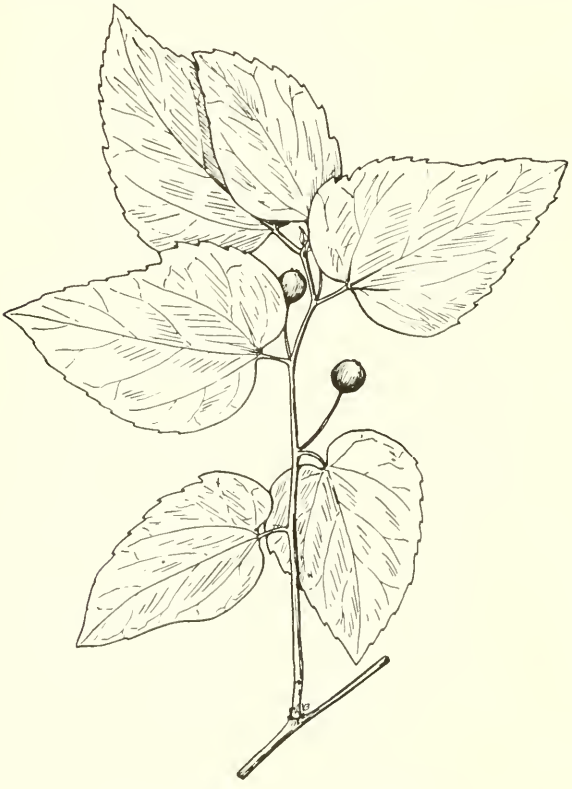

Fig. 22. Hackberry (*Celtis Douglasi*).

above, light yellowish-green below, usually very rough to the touch; flowers greenish, borne singly or in pairs in the leaf-axils; fruits small, cherry-like, at first green, becoming orange-red or yellow, the flesh thin, dry, sweetish, covering a hard seed. (Syn. *C reticulata* Torr.).

Hackberry occurs usually in dry gravelly soils in canyons, and it is not common in the western parks. The small cherry-like fruits were eaten by the Indians.

Occurrence.—ZION, occasional, 4,400 to 5,500 feet: Zion-Mount Carmel highway; Zion Canyon below the Organ; the Narrows trail. GRAND CANYON, occasional in the canyon, 2,500 to 6,000 feet: Indian Gardens (tree form); Bright Angel trail about 2 miles below the South Rim; Dripping Spring; Havasu Canyon.

BUCKWHEAT FAMILY (Polygonaceae)

BUCKWHEATBRUSH (*Eriogonum* Michx.)

The genus, *Eriogonum,* is represented in the national parks by a large group of plants, including herbs, shrubs, and part-shrubs. Some of the latter with branched woody bases are included in this account. In all of the more or less woody species the herbage tends to be white-felty or with yellowish tawny felt. Mature leaves of some of the species are often dark green and nearly smooth above, but the young leaves and twigs are always felty. The flowers have no petals but the calyx is a colored cup-like structure resembling a corolla. Several tiny flowers are usually borne together in a small cup-like involucre. These, in turn, may be borne singly or in groups of several along the flowering stems, or they may be clustered together in dense heads. In many of the species, especially the herbaceous, the heads are borne in umbels (umbrella-like clusters). Most of the species are of little use as forage.

FIELD GUIDE TO THE SPECIES

Flower-involucres scattered along the relatively few more or less erect branches or clustered into heads at the ends.

Involucres many-flowered, clustered in heads; plants 1½ to 3 feet high; found in the Southwest ..... 1. *E. fasciculatum.*

Involucres few-flowered, only rarely clustered in heads; plants ½ to 1 (or 2) feet high; found in Sierra Nevada and Southwest ..... 2. *E. Wrighti.*

Flower-involucres scattered along widely spreading branchlets of intricately branched flower-clusters.

Stems woody above base; flower-clusters distinctly flat-topped; involucres more or less woolly ..... 3. *E. microthecum.*

Stems woody only at base; flower-clusters not distinctly flat-topped; involucres not hairy or somewhat hairy on margins.

Branches of flower-clusters rigid, often spine-tipped; low plants 6 to 8 inches high ..... 4. *E. sulcatum.*

Branches of flower-clusters flexuous, not spine-tipped; plants 1 to 2 feet high ..... 5. *E. plumatella.*

1. ROSEMARY BUCKWHEATBRUSH (*Eriogonum fasciculatum* Benth. var. *polifolium* (Benth.) T. & G.).—Flat-topped evergreen bushy shrub 1½ to 3 feet high, with shreddy bark and clustered leafy stems; herbage grayish; leaves

½ to 1 inch long, oblong to linear, the margins inrolled, bunched along the stems and resembling rosemary; flowers white or pinkish, the involucres many-flowered and clustered in heads at the ends of the branchlets, these flower-bearing branchlets borne several at the top of the erect leafy branches, forming flat-topped clusters or umbels.

This species is a good browse for animals, especially during the winter.

Occurrence.—GRAND CANYON: Kaibab trail below the South Rim.

2. WRIGHT'S BUCKWHEATBRUSH (*Eriogonum Wrighti* Torr.).—Small much-branched shrub ½ to 1 (or 2) feet high, with erect stems densely leafy below; leaves ¼ to 1 inch long, oblong to nearly linear due to inrolled margins, pointed at the tips; flowers white or cream-color with red veins, or reddish, the involucres scattered along or crowded near the ends of the repeatedly 2- or 3-forked branches.

Occurrence.—YOSEMITE, 6,000 to 10,000 feet: Snow Lake trail near northern boundary; Le Conte Point; Matterhorn Canyon; Lyell Fork Merced River; Cold Canyon, north of Glen Aulin; Cascades. KINGS CANYON: between East Lake and Junction Meadows; Zumwalt Meadows. SEQUOIA, 8,000 to 10,000 feet: Mineral King trail to Sawtooth Peak; Little Kern River. GRAND CANYON.

Fig. 23. Slender buckwheatbrush (*Eriogonum microthecum*).

3. SLENDER BUCKWHEATBRUSH (*Eriogonum microthecum* Nutt.), fig. 23.—Low bushy shrub up to about 1 foot high; bark shreddy or somewhat scaly; leaves usually scattered on the stems, or often crowded below, narrowly oblong to spatula-shaped, 1/3 to ¾ inch long; flowers yellow to reddish, the clusters few-flowered at the ends of umbel-like branches. (Syns. *E. corymbosum* Benth. and *E. Simpsoni* Benth., as to the Southwest parks, *E. divergens* Small. We include here also *E. aureum* Jones as listed by Kearney and Peebles.[14]

This is a fairly good browse plant for animals, especially during the winter.

Occurrence.—YOSEMITE: Mono Pass, east of park boundary. MESA VERDE. BRYCE CANYON. ZION. GRAND CANYON, 6,200 to 9,000 feet. North Rim: Point Sublime; Lauzon Ranch; Point Imperial. South Rim: Yaki Point.

4. SPINY BUCKWHEATBRUSH (*Eriogonum sulcatum* Wats.).—Small, diffusely-branched shrub 6 to 8 inches high; flowering stems intricately branched with short, stiff, angular branches, often spine-tipped, forming a dense flat-topped bush; leaves 1/3 to ½ inch long, linear to oblong or egg-shaped; flowers white to cream-color or pinkish.

Occurrence.—GRAND CANYON. North Rim, 8,350 feet: Grama Point .

5. YUCCA BUCKWHEATBRUSH (*Eriogonum plumatella* D. & H.).—Widely branching low bushes 1 to 2 feet high; flowering stems much-branched with short, often zigzag branches, and giving a contorted appearance to the flower-cluster; flowers cream to pink, or turning reddish.

Occurrence.—GRAND CANYON: Kaibab trail along switchbacks below Tip-off.

BARBERRY FAMILY (Berberidaceae)

HOLLYGRAPE (*Mahonia* Nutt.)

The hollygrapes are evergreen shrubs with the leaves divided into spine-toothed holly-like leaflets and with conspicuous clusters of yellow flowers. The purplish-blue grape-like berries of most of the species have an agreeably tart flavor and are sometimes gathered for jelly. Birds and the smaller mammals are fond of them. The spiny foliage is of little use as a browse but it is sometimes eaten when other food is scarce. Indians of the different regions used the bark and roots medicinally.

The hollygrapes are often included in the genus *Berberis*, barberry. They differ from the true barberry, however, in having stems without spines, leaves pinnately divided into prickly-toothed leaflets, and purple-blue berries with a bloom. Some of the species of barberry act as alternate hosts for a black-stem rust of grains. This disease is caused by a fungus which spends part of its life history on the barberry leaves. None of the hollygrape species have been found to be susceptible except Fremont hollygrape and, to a less extent Oregon grape.[15] (Syn. *Berberis* L., in part, *Odostemon* Raf.)

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14 Kearney, T. H. & Peebles, R. H. Flowering Plants and Ferns of Arizona, p. 253. 1942.

15 Van Dersal, W. R., Native Plants of the United States, p. 70. 1938.

FIELD GUIDE TO THE SPECIES

Leaflets 3 to 11; flower clusters short, 1 to 2½ inches long; bud scales small, soon falling.

Leaflets 3 to 7, thick and leathery, comparatively few-toothed, the margins rigidly spine-toothed; coarse shrubs.

Leaflets 3 to 5, dull yellowish, ½ to 1 inch long, narrowly egg-shaped, usually about ½ inch wide and with a long pointed tip; flowers in rather loose few-flowered clusters along the stems; occurs in the Southwest ..... 1. *M. Fremonti.*

Leaflets 3 to 7, usually green above, dull below, oval to egg-shaped, 1 to 2 inches long, ½ to ¾ inch wide; flowers borne in compact clusters along the stems; occurs in Sequoia National Park ..... 2. *M. dictyota*

Leaflets 3 to 11, thinner, with more numerous teeth and slender spines; plants ½ to 3 feet high.

Stems prostrate or ascending, ½ to 1 foot high; leaflets dull green; found in Rocky Mountains and Southwest ..... 3. *M. repens.*

Stems erect, 1 to 3 feet high; leaflets shiny-green above; found in the Northwest.

Leaflets glossy-green and smooth below; occurs at Olympic and Mount Rainier National Parks ..... 4. *M. aquifolium.*

Leaflets dull below and covered with fine protuberances; occurs at Crater Lake National Park ..... 5. *M. Piperiana.*

Leaflets 11 to 21, shiny green above; flower clusters elongated, 2 to 6 inches long; bud scales ¾ to 1¾ inches long, persistent; occurs in Northwest ..... 6. *M. nervosa.*

1. FREMONT HOLLYGRAPE (*Mahonia Fremonti* (Torr.) Fedde), fig. 24. —Stiffly branching shrub 4 to 8 feet high, or tree-like and becoming 15 feet high; bark rough and furrowed; leaflets 3 to 5, ½ to 1 inch long, narrowly egg-shaped, the terminal tapering to a long point at the tip, yellowish or grayish-green, stiff and leathery, the margins with 5 to 7 rigidly spine-tipped teeth; flowers yellow, 3 to 9 in a cluster at the ends of short slender stems, these stems borne singly or in groups of several on short leafy branches along the main stems; fruit a berry, roundish, about ½ inch or less in diameter, at first dark blue, later becoming dull brown, dry and somewhat inflated. (Syn. *Berberis Fremonti* Torr.).

Fremont hollygrape is known also as yellow-wood because the bark and roots were used by the Navajo Indians to make a yellow dye for buckskins, cloth and baskets. The leaves are sometimes browsed by deer in the winter or when other food is scarce. This species has been found to be susceptible to the black stem rust of grains.

Occurrence.—ZION, reported from lower elevations. GRAND CANYON, 3,800 to 7,000 feet. South Rim, in the piñon-juniper belt: near Bright Angel Lodge; trail to Powell Memorial; south of Rowe's Well; Yavapai Point; Desert View. Canyon, common on south side of Colorado River: Bright Angel trail; Indian Gardens.

2. NETVEIN MAHONIA, CALIFORNIA HOLLYGRAPE (*Mahonia dictyota* (Jepson) Fedde.).—Bushy shrubs 1 to 6 feet high, sometimes forming thick-

ets; leaflets 3 to 7, 1 to 2 inches long, oval to broadly egg-shaped, thick and leathery, glossy green or yellowish above, dull or whitish below, the margin wavy, toothed with rigid spine-tipped teeth; flowers many, usually borne in oblong clusters occurring together in bunches at the ends of the stems and in the leaf-axils; berries about 1/4 to 1/3 inch in diameter, purple-blue with a whitish bloom. (Syn. *Berberis dictyota* Jepson.)

Occurrence.—SEQUOIA, occasional in lower foothills: hillsides above Clough Cave.

3. CREEPING MAHONIA, CREEPING HOLLYGRAPE (*Mahonia repens* (Lindl.) G. Don), fig. 25.—Dwarf shrub 4 to 12 inches high; leaves clustered at the base of short flowering stems, dull green above, whitish below, divided into 3 to 7 leaflets; leaflets oval, 1 to 2 inches long, the margins rather weakly spine-toothed; flowers yellow, borne in dense clusters at the ends of the short erect stems; berries blue, with a whitish bloom. (Syn. *Berberis repens* Lindl.)

Fig. 24. Fremont hollygrape (*Mahonia Fremonti*).

Fig. 25. Creeping hollygrape (*Mahonia repens*).

The main stem of this species, creeping along the ground, is often covered with forest duff so that the plants appear to consist of only short erect flowering stems. The leaves turn beautiful shades of red, yellow, or purple in the Fall.

Occurrence.—GLACIER, common in the woods, 3,100 to 5,000 feet: Belton; North Fork Flathead River road; Kintla Lake; Bowman Lake; Lake McDonald; St. Mary Lake; Cutbank Valley; Two Medicine Valley; Swiftcurrent Lake. YELLOWSTONE: above Mammoth Hot Springs. GRAND TETON. ROCKY MOUNTAIN. MESA VERDE: north slope of Navajo Canyon. BRYCE CANYON, common in the forest on the plateau, 7,800 to 9,100 feet: near the Lodge; Farview; Rainbow Mountain. ZION, 4,000 to 6,000 feet: along the Narrows trail; canyon on west side of Checkerboard Mesa. GRAND CANYON, 4,500 to 8,800 feet. North Rim, common in the ponderosa pine forest; road to Cape Royal; park headquarters. South Rim: Shoshone Point. Canyon, common: upper part of Bright Angel trail; Kaibab trail below North Rim.

4. OREGON GRAPE, MOUNTAIN HOLLY (*Mahonia aquifolium* (Pursh) Nutt.), fig. 26.—Shrub 1 to 3 feet high with erect stems; leaf stems with 3 to 11 leaflets; leaflets oblong, 1 to 3 inches long, bright shiny green above, duller below, rather thin but tough and leathery, the margins spine-toothed; flowers bright yellow, borne in clusters at the ends of the branches and along the stems in the leaf-axils; berries about the size of a pea, dark blue, with a whitish bloom.

This is a handsome shrub which is distinctly northwestern in its range, occurring in the hills and mountains of northern California north to British Columbia. The species name, *aquifolium*, means sharp leaf, referring to the spine-toothed leaflets. The plants sometimes form dense thickets in the woods. Oregon grape is the state flower of Oregon. (Syn. *Berberis aquifolium* Pursh.)

Occurrence.—OLYMPIC, common: Elwha River; Mount Angeles. MOUNT RAINIER, occasional in open woods.

Fig. 26. Oregon grape (*Mahonia aquifolium*).

5. PIPER MAHONIA, PIPER HOLLYGRAPE (*Mahonia Piperiana* Abrams). —Erect shrub 2/3 to 2 feet high; leaflets 5 to 9, egg-shaped, 1 to 2½ inches long, glossy-green above, dull below with fine protuberances, the margins spine-toothed with slender spines; flowers yellow, borne in rather dense clusters 1¼ to 2¾ inches long; berries blue-black, narrowly ovoid, about ¼ inch long. (Syn. *Berberis Piperiana* (Abrams) McMinn.)

Occurrence.—CRATER LAKE: north wall of Red Blanket canyon near southwestern park boundary.

6. CASCADES HOLLYGRAPE, CASCADES MAHONIA (*Mahonia nervosa* (Pursh) Nutt.).—Low shrub 6 to 18 inches high; leaves about as long as the flowering stem and clustered at its base; leaflets 9 to 21, dark green, shiny, about 1 to 3 inches long, broadly lance-shaped to egg-shaped, pointed at the tip, the margins spine-toothed; flowers yellow, borne in oblong clusters 2 to 6 inches long, these single or in bunches of several at the ends of the

erect unbranched stems; berries about the size of a pea, dark blue, covered with a whitish bloom. (Syn. *Berberis nervosa* Pursh.)

Occurrence.—OLYMPIC, common in the woods up to 2,000 feet: Lake Crescent; Elwha River near Elkhorn guard station. MOUNT RAINIER, common in the woods up to about 4,500 feet: Longmire; vicinity of Kautz Creek; park entrances. CRATER LAKE, rare along the southern boundary of the park: Redblanket Canyon; southeast corner of park.

PIGWEED FAMILY (Chenopodiaceae)

FIELD GUIDE TO THE GENERA

Leaves linear, fleshy.

Shrubs 3 to 5 feet high; branchlets somewhat spine-tipped; fruits with a broad circular wavy wing around the middle, the wing 1/3 to ½ inch across ..... SARCOBATUS, p. 75.

Shrubs 1 to 3 feet high; branchlets not spine-tipped; fruits not winged ..... SUAEDA, p. 75.

Leaves linear to egg-shaped or roundish, not fleshy or sometimes slightly thickened.

Leaves linear due to inrolled margins; fruits densely white-hairy or cottony ..... EUROTIA, p. 76.

Leaf-margins not rolled under; fruits not cottony.

Bracts surrounding fruit united into a single roundish or oval flattened sac-like structure notched at the tip; branchlets spine-tipped..... GRAYIA, p. 76.

Bracts surrounding fruits separate, or if united nearly to the tip, the tips pointed or 3-toothed and the backs with tooth-like swellings ..... ATRIPLEX, p. 76.

GREASEWOOD (*Sarcobatus vermiculatus* Torr.).—Much-branched shrub, 3 to 5 feet high, with spine-tipped branchlets; bark white, or becoming gray or blackish; leaves alternate, linear, fleshy, flat above, rounded below, ½ to 2 inches long, smooth; male flowers borne in dense, cylindrical, cone-like clusters at the ends of short branches; female flowers small, inconspicuous, greenish, without petals, borne on short branches in the leaf-axils, often on different plants from the male flowers; fruits small, with a thin, wavy, ruffle-like wing around the middle.

This shrub is characteristic of the dry, alkaline plains through the West, especially in areas having black alkali soil which is considered worthless for agricultural purposes. The bushes are intricately branched with many of the rigid branchlets becoming spine-like at the tips, the small fleshy leaves, young stems, and seeds are eaten by many forms of wild life. The plant is particularly valuable as winter feed, ranking in importance with winterfat and big sagebrush. The green twigs as well as the seeds were eaten by the Indians. The wood is used as fuel by the Hopi Indians.

Occurrence.—YELLOWSTONE: Gardiner River north of Mammoth Hot Springs; between Mammoth and Gardiner. MESA VERDE: Navajo Canyon at mouth of Spruce Canyon.

DESERT BLIGHT (*Suaeda Torreyana* Wats.).—Straggly, more or less woody, evergreen plant, 1 to 3 feet high; leaves linear, fleshy, ½ to 1 inch long, or the upper reduced; flowers small, inconspicuous, without petals, borne

in clusters of 1 to several in the leaf-axils; fruits small, seed-like, enclosed by the fleshy calyx.

Occurrence.—ZION: just outside western park boundary along road to Petrified Forest, 4,000 feet.

WINTERFAT (*Eurotia lanata* (Pursh) Moq.).—Low shrub with slender branches; herbage densely white-fuzzy, or later turning rusty; leaves ½ to 1½ inches long, oblong or linear due to inrolled margins; flowers borne along the stems in the upper leaf-axils, without petals, the male and female flowers borne separately on the same or on different plants; fruits small, seed-like, covered with cottony hairs nearly ¼ inch long.

This is a widespread species in the West, particularly in dry locations, commonly in association with greasewood, saltbush, or mesquite. The whole plant is whitish or rusty with long matted hairs and hence is often called white sage. In late summer the ends of the branches are covered with white-cottony fruiting masses. The plant is very nutritious and is much valued as a winter feed for animals. The seeds are eaten as well as the herbage.

Occurrence.—YELLOWSTONE, occasional: between Mammoth and Gardiner. MESA VERDE, rare: along the highway near the north entrance. GRAND CANYON. South Rim: Pasture Wash, 6,300 feet.

SPINY HOP-SAGE (*Grayia spinosa* Moq.).—Low, bushy shrub, 1 to 3 feet high; bark more or less shreddy; branchlets pale, usually spine-tipped; herbage grayish-white, mealy or scurfy when young, the older green; leaves small, spatula-shaped, 1/3 to 1¼ inches long, somewhat fleshy; male flowers small, borne in inconspicuous greenish clusters in the leaf-axils; female flowers borne close together at the ends of the branches; fruits seed-like achenes surrounded by a pair of united bracts forming a roundish wing-like sac ¼ to ½ inch in diameter, notched at the tip. This plant is excellent as a browse for animals, being especially nutritious and fattening when in fruit.

Occurrence.—YELLOWSTONE, rare: Gardiner River north of Mammoth Hot Springs. ZION. GRAND CANYON, in the canyon.

SALTBUSH (*Atriplex* L.)

The saltbushes are commonly found in the dry salt or alkali plains of the Southwest and the Great Basin area where they often form the dominant species over extensive areas. The plants furnish important forage for animals. The salt flavor of the herbage apparently makes it especially palatable and the fruits, which are usually produced very abundantly, are reputed to be very nutritious and fattening. The Indians of the Southwest boiled the stems for flavoring wheat or corn pudding.[16] Also the seeds were dried, parched and ground into a meal for food.

FIELD GUIDE TO THE SPECIES

Bushes more or less spiny; leaves egg-shaped or elliptic, rounded at the tip, ¼ to 2/3 inch long; fruit with 2 wing-like bracts spreading fan-like from the top of the seed, these roundish or somewhat triangular, 1/3 to ¾ inch long, the margins sometimes shallowly toothed ..... 1. *A. confertifolia.*

16 Yanovsky, Elias, Food plants of the North American Indians: United States Department of Agriculture, publication 237, p. 21, 1936.

Bushes not spiny; leaves linear to oblong, ¾ to 2 inches long.
Fruit with 4 conspicuously winged bracts; wings thin, roundish, ¼ to ½ inch long, the margins smooth or irregularly toothed or frayed ..... 2. *A. canescens.*

Fruit with 2 thickish spongy bracts united nearly to their tips; bracts convex, pointed or 3-toothed at the tip, crested on the backs with conspicuous teeth-like appendages ..... 3. *A. Gardneri.*

1. SHADSCALE, SPINY SALTBUSH (*Atriplex confertifolia* (Torr. & Frem.) Wats.).—Compact, round-topped shrub, 1 to 4 feet high, many of the branches ending in spinose tips; leaves thickish, egg-shaped to almost round, rounded at the tips, ¼ to 2/3 inch long; flower clusters small, borne in the leaf-axils; fruits with 2 broad, more or less triangular wings 1/3 to nearly 1 inch long at the top.

Occurrence.—MESA VERDE: near junction of Navajo and Spruce Canyons.

2. FOURWING SALTBUSH (*Atriplex canescens* (Pursh) Nutt.).—Round-topped rigidly branched shrub 1 to 5 feet high with grayish-white herbage; leaves narrowly oblong or broader at the tip, ¾ to 2 inches long, finely scurfy-fuzzy; flowers tiny, greenish or yellowish, borne in dense clusters in the leaf axils or on short branches; fruits small seed-like structures with 4 conspicuous wings, the wing ¼ to ½ inch long and two-thirds as broad.

Occurrence.—MESA VERDE: mouth of Spruce Canyon, 6,300 feet. ZION, common in the lower canyons, 3,500 to 4,500 feet: near west entrance. GRAND CANYON, 2,500 to 7,000 feet. South Rim, occasional: Pasture Wash; 2 miles south of Yaki Point. Canyon, common, 2,500 to 4,000 feet: Phantom Ranch; Kaibab trail about 1¾ miles below Yaki Point; switchbacks below Tip-off; Bright Angel trail about 1 mile above Indian Gardens; Kaibab trail on Tonto north of the Colorado River; Shinumo Creek.

3. GARDNER SALTBUSH (*Atriplex Gardneri* (Moquin) Standl.).—Low, diffusely-branched shrub, 2/3 to 3 feet high, with greenish scaly foliage; leaves oblong, tapering to the base; male flowers borne in narrow, dense clusters at the ends of the branches; female flowers clustered in the leaf-axils and at the ends of the stems; fruits with 2 more or less spongy convex wings, the wings more or less egg-shaped, with toothed margins and irregular swellings on the sides. (Syn. *A. Nuttalli* Wats.).

Occurrence.—YELLOWSTONE: between Mammoth and Gardiner. MESA VERDE: Navajo Canyon below Spruce Canyon.

BUTTERCUP FAMILY (Ranunculaceae)

CLEMATIS, VIRGIN'S BOWER, LEATHER-FLOWER (*Clematis* L.)

The woody-stemmed Clematis species are mostly vines, commonly climbing over bushes, trailing over the ground, or sometimes climbing trees. The flowers, although without true petals, are quite conspicuous because of the white or purple-blue petal-like sepals. The fruits, which develop rapidly into small seed-like achenes with long white-fuzzy tails, are clustered into

conspicuous fluffy heads sometimes 2 inches in diameter. The leaves are sometimes browsed by animals.

FIELD GUIDE TO THE SPECIES

Flowers white, borne in several-flowered clusters, the petal-like sepals about 1/2 inch long; leaves mostly divided into 5 or 7 leaflets ..... 1. *C. ligusticifolia.*

Flowers purple-blue, borne singly, the petals about 1 to 1 1/2 inches long; leaves divided into mostly 3 leaflets.

Leaflets irregularly toothed or nearly untoothed, not divided ..... 2. *C. verticillaris.*

Leaflets divided into 3 deeply toothed divisions ..... 3. *C. pseudoalpina.*

1. WESTERN VIRGIN'S BOWER (*Clematis ligusticifolia* Nutt.).—Climbing vine with more or less woody stems 6 to 30 feet long; leaves in opposite pairs along the stems, composed of 5 to 7 leaflets; leaflets 1 to 3 inches long, egg-shaped to oblong-egg-shaped, sometimes with 3 broad lobes, the margins often coarsely toothed; flowers white, 1/2 to 3/4 inch across, borne in several- to many-flowered clusters in the leaf-axils; sepals 4, petal-like, about 1/4 to 3/8 inch long; seeds with white fuzzy tails about 1 to 1 1/2 inches long, borne in conspicuous fluffy heads. (Syn. *C. brevifolia* (Nutt.) Howell.)

This is a common vine of the lower elevations in the West, but is not abundant in the national parks. The stems ramble high over bushes, often climbing trees, and producing white flowers in great abundance. The clusters, which sometimes become 1 foot long, make quite a show, even in fruit. An infusion of the leaves and stems was used by early settlers of certain regions for healing sores and cuts on horses.

Occurrence.—YOSEMITE, at the lower elevations: Wawona; Hetch Hetchy. GLACIER, rare on dry rocky slopes: at base of rock wall at East Glacier Campgrounds. YELLOWSTONE, occasional: near Mammoth. ROCKY MOUNTAIN, occasional: Estes Park. MESA VERDE. BRYCE CANYON: Tropic Canyon, near eastern boundary. ZION, occasional. GRAND CANYON. Canyon below the South Rim: Bright Angel trail; upper Bass Canyon, 5,800 feet. North Rim: Cape Royal road; Powell Spring.

2. PURPLE VIRGIN'S BOWER (*Clematis verticillaris* DC.).—Trailing or climbing vine with slender stems; leaves borne in opposite pairs along the stems, divided into 3 leaflets; leaflets 3 to 4 inches long, egg-shaped to oblong-egg-shaped, pointed at the tips, the margins coarsely toothed or not toothed, slightly hairy on the veins below, otherwise the foliage smooth; flowers single on slender stems in the leaf-axils, with 4 purple-blue to pinkish-purple sepals spreading to 2 1/2 or more inches across; seed-like achenes hairy, with long feathery styles up to 2 inches long, bunched into conspicuous white fluffy heads.

Occurrence.—ISLE ROYALE, common in the woods and in old burned areas.

2a. WESTERN PURPLE VIRGIN'S BOWER (Var. *columbiana* Gray), fig. 27.—Similar to the species but the leaflets broadly egg-shaped. (Syns. *Clematis columbiana* (Nutt.) Torr. & Gray, *C. occidentalis* Hornem.)

Occurrence.—GLACIER, common, 3,100 to 7,000 feet: Lake McDonald; upper Nyack Valley; Dawson Pass; St. Mary Lake; Otokomi Lake trail; Swiftcurrent Lake; Red Eagle Valley. YELLOWSTONE: Mammoth Hot Springs. GRAND TETON: moraine between Phelps Lake and the Snowshoe Cabin, 6,800 feet. ROCKY MOUNTAIN: in moist woods at higher elevations.

Fig. 27. Western purple virgin's bower (*Clematis verticillaris* var. *columbiana*).

3. ALPINE CLEMATIS (*Clematis pseudoalpina* (Kuntze) Nels.), fig. 28. —Similar to purple clematis but the leaves divided into 3 leaflets and these again deeply lobed or divided into 3 smaller toothed leaflets; stems trailing over low bushes, scarcely at all climbing; flowers purple-blue, the sepals 4, 1 to 2 inches long; seed-like achenes with long feathery tails.

Occurrence.—ROCKY MOUNTAIN. MESA VERDE. BRYCE CANYON: Rainbow Point. ZION: Narrows trail. GRAND CANYON, in the canyon below both rims, 7,000 to 8,000 feet: Bright Angel trail below second tunnel; Kaibab trail below both rims.

SWEETSHRUB FAMILY (Calycanthaceae)

CALIFORNIA SWEETSHRUB, SPICEBUSH (*Calycanthus occidentalis* H. & A.), fig. 29.—Erect, branching shrub, usually about 5 to 8 feet high; bark

Fig. 28. Alpine clematis (*Clematis pseudoalpina*).

smooth; leaves oblong-egg-shaped to lance-shaped, rounded at base, tapering to a point at the tip, 1½ to 6 inches long, the margins not toothed or rarely with few low teeth, borne opposite each other on the stems; flowers resembling small chrysanthemums; petals many, about 1 inch long, deep wine-red, fading brownish; fruit a brownish-green urn-shaped cup, about 1 inch long, outer surface marked with ridges, containing brownish seed-like achenes about 1/3 inch long.

Fig. 29. California sweetshrub (*Calycanthus occidentalis*).

California sweetshrub is an attractive shrub with large dark green leaves and dark wine-red flowers resembling small chrysanthemums. The petals turn brownish in age. The flowers and even the leaves have a sweet aromatic odor when crushed. The fruits are brownish cup-like or urn-shaped structures, with ridged markings on the outside. Tests have shown that the southeastern species, Carolina allspice (*Calycanthus floridus*), contains a substance resembling strychnine in its action. California sweetshrub is also reputed to be poisonous to stock, although the bush is seldom browsed. The species is sometimes planted as an ornamental.

Occurrence.—YOSEMITE, 1,700 to 4,000 feet: Merced Canyon; Cascade Creek; near Arch Rock ranger station; near Awahnee Hotel. SEQUOIA, common, 1,600 to 4,000 feet: near Ash Mountain; upper part of Paradise Creek valley.

POPPY FAMILY (Papaveraceae)

BUSH POPPY (*Dendromecon rigida* Benth.).—Rigidly-branched shrub 2 to 8 feet high; stems whitish; lower bark shreddy; leaves yellowish- or grayish-green, oblong-egg-shaped to lance-shaped, pointed at the tip, 1 to 2½ inches long, somewhat leathery, the margins not toothed or very finely toothed; flowers golden yellow, 1 to 3 inches across, 4-petalled, borne on slender stems 1 to 3 inches long; fruit a slender curved capsule 2 to 4 inches long, splitting upwards from the base.

Bush poppy occurs on dry slopes and ridges at middle elevations in California. The bushes are ordinarily evergreen, but during hard winters they may lose their leaves and become straggly in appearance. The species is a very attractive shrub when growing in favorable situations and is often cul-

tivated as an ornamental because of the large yellow flowers. The foliage is occasionally browsed by deer.

Occurrence.—YOSEMITE, common below the park and possibly occurring inside park boundary: South Fork Merced River just west of park boundary, 5,600 feet; southwest of Deer Flat, west of park boundary. SEQUOIA: 3 miles west of Panorama Peak 3,000 feet; Mineral King road; Ash Mountain road.

HYDRANGEA FAMILY (Hydrangeaceae)

FIELD GUIDE TO THE GENERA

Sepals and petals 4; flowers borne singly or few to many in oblong clusters; capsules splitting into 4 sections.

Leaves oblong to egg-shaped or roundish; petals tapering gradually to the base; stamens numerous ..... PHILADELPHUS, p. 81.

Leaves oblong to narrowly oblong; petals abruptly narrowed to a stalk-like base or claw; stamens 8 ..... FENDLERA, p. 83.

Sepals and petals 5; flowers borne in more or less flat-topped clusters; capsules splitting into 3 to 5 (or 7) sections.

Leaves narrowly oblong, ¼ to ¾ inch long, light grayish-green, smooth, not toothed; found in the Southwest ..... FENDLERELLA, p. 83.

Leaves elliptic to oval, ½ to 2 inches long, dark green above, white-hairy below, coarsely toothed; found in Sierra Nevada and Rocky Mountains ..... JAMESIA, p. 83.

MOCK-ORANGE (*Philadelphus* L.)

The mock oranges may be recognized by the opposite leaves and branches, the leaves 3-veined from the base, and the showy white 4-petalled flowers. Littleleaf mock orange, the species occurring in the Southwest, has much smaller leaves than that found in the Pacific coast parks. It may often be confused with *Fendlera,* which occurs also in the Southwest, but the flowers are a little smaller and the petals not clawed at the base. Lewis mock orange or 'syringa' is very popular as an ornamental shrub and many varieties have been developed under cultivation. The Indians of certain regions used the straight shoots for arrow shafts. Deer and elk browse the foliage to a certain extent.

FIELD GUIDE TO THE SPECIES

Leaves 1½ to 3 inches long; flowers borne in showy clusters of 5 to 20 at the ends of the branches; occurs in the Rocky Mountains and on the Pacific coast ..... 1. *P. Lewisi.*

Leaves ½ to about 1 inch long; flowers 1 to 3 at the ends of the branches; occurs in the Southwest ..... 2. *P. microphyllus.*

1. LEWIS MOCK-ORANGE, SYRINGA (*Philadelphus Lewisi* Pursh), fig. 30.—Loosely branched shrub 2 to 12 feet high with ascending branches, the young twigs smooth and reddish-brown; leaves opposite, 1½ to 3 inches long, thinnish, egg-shaped to oblong or rounded, somewhat pointed at the tip, 3-veined, the margins not toothed or with a few low teeth; flowers ¾ to 1½ inches across, white, borne in showy clusters on slender branchlets towards the ends of the stems; fruit a dry woody capsule, about ⅜ inch long, splitting

into 4 sections from the top; seeds numerous. (Syns. *P. californicus* Benth., *P. Gordonianus* Lindl.

Occurrence.—OLYMPIC: Lake Crescent; Elwha River. MOUNT RAINIER, in moist open woods. CRATER LAKE, rare: southwest corner of the park. YOSEMITE, common along streams, 2,200 to 5,000 feet: El Portal checking station; near Sentinel Hotel; Awahnee Hotel; Bridalveil Falls; Yosemite Falls; Coulterville road; Hetch Hetchy Valley. SEQUOIA: Colony Mill road; South Fork Kaweah River; 1 mile east of Hospital Rock. GLACIER, occasional, 4,500 to 5,500 feet: Going-to-the-Sun Highway 1 mile below Going-to-the-Sun Chalet; Otokomi Lake trail; highway northwest of Logan Pass; Nyack Valley above first snowshoe cabin.

2. LITTLELEAF MOCK-ORANGE (*Philadelphus microphyllus* Gray).—Spreading, stiffly-branched shrub 3 to 6 feet high; leaves opposite, ½ to 1 inch long, oblong to egg-shaped, pointed at the tips, thinly to densely hairy, especially below; flowers 1 to 3 at the ends of the branchlets; petals 4, white, about 1/3 to ½ inch long; fruit a woody capsule about ¼ to ⅜ inch long, splitting into 4 sections from the top; seeds numerous.

There is a great deal of variation in the hairiness of the leaves which has given rise to several named forms, but other distinctions are very slight. (Syns. *P. argyrocalyx* Woot., *P. occidentalis* Nels., *P. argenteus* Rydb., *P. serpyllifolius* Gray, as listed from our areas.)

Occurrence.—MESA VERDE, rare: 6,000 to 6,600 feet: Navajo Canyon below Spruce Canyon; Spruce Canyon below park headquarters. ZION, occasional, about 5,000 feet: above Weeping Rock on trail to east rim; Zion Arch trail. GRAND CANYON, 6,000 to 8,800 feet. North Rim, common near edge of rim: Cape Royal; Point Imperial; Bright Angel Point. South Rim, occasional just below rim: Bass Camp. Canyon, occasional:

Fig. 30. Lewis mock-orange (*Philadelphus Lewisi*).

Fig. 31. Fendlera (*Fendlera rupicola*).

Bright Angel trail; Kaibab trail at base of first switchbacks below Yaki Point; Kaibab trail below North Rim; upper Bass Canyon.

FENDLERA (*Fendlera* Engelm. & Gray)

Fendlera is a conspicuous shrub of the Southwest with showy white flowers. The petals are narrowed abruptly into a stalk-like base (or claw) so that the open flower resembles a maltese cross. Several forms have been described as occurring in the parks of the Southwest, but since the distinguishing characters are variable, no attempt has been made here to segregate the different forms. Shrubs with leaves somewhat narrower than others and curved (or falcate) have been designated as *F. falcata* Thorn.; those with densely hairy leaves, whitish below, have been called *F. tomentella* Thorn.; and shrubs with nearly smooth leaves or only scattered hairs on the lower surface, the most common form, are called *F. rupicola* Gray. By some botanists the two first-named species are considered varieties of the last.

FENDLERA (*Fendlera rupicola* Gray). fig. 31.—Erect, rigidly-branched shrub 3 to 6 feet high; older bark gray and furrowed, the twigs smooth, usually reddish or yellowish; leaves opposite, light dull green, ½ to 1¼ inches long, narrowly oblong, strongly 3-veined from the base; flowers showy, white, about 1 inch across, borne in clusters of one to several; petals roundish at the tips, with claw-like base; capsules narrowly egg-shaped, about ½ inch long, splitting into 4 sections from the top.

Occurrence.—MESA VERDE, common, 6,800 to 8,500 feet: park headquarters; north boundary of the park. GRAND CANYON, 4,500 to 7,000 feet. South Rim, occasional at edge of rim. Canyon, abundant on both sides of the Colorado River: Kaibab trail above Roaring Springs; Kaibab trail below South Rim; Bright Angel trail; Berry trail; Hermit trail.

YERBA DESIERTO (*Fendlerella utahensis* (Wats.) Hell.).—A spreading shrub forming a dense low bush 4 to 12 inches high or sometimes nearly 3 feet high; old bark rough and stringy, grayish, the younger smooth and whitish; leaves light grayish-green, ¼ to ¾ inch long, narrowly oblong; flowers small, white, borne in flat-topped clusters about 1 to 1½ inches across; petals 5; capsules small, oblong, about ¼ inch long, splitting from the top into 3 sections; seeds 3, one in each cell. (Syns. *F. cymosa* Greene, *Whipplea utahensis* Wats.).

Occurrence.—MESA VERDE. GRAND CANYON, 4,500 to 8,800 feet. North Rim, common on rocky points at edge of rim: Bright Angel Point; Cape Royal; Point Sublime; Point Imperial. South Rim, occasional at edge of rim: Grand View Point; east of Yavapai Point. Canyon, common: Kaibab trail below both rims; Bright Angel trail down as far as trail shelter about 1½ miles above Indian Gardens.

CLIFFBUSH (*Jamesia* T. & G.)

This beautiful shrub was named after Edwin James, a botanist on Long's expedition to the Rocky Mountains in 1820. It has also been called *Edwinia* after the same man. Throughout most of tis range it is a widely branching shrub, usually with reddish-brown branches and twigs. In the autumn the

leaves turn beautiful shades of red. Both the species and variety are often cultivated as ornamentals.

FIELD GUIDE TO THE VARIETIES

Shrubs usually more than 3 feet high; leaves ¾ to 2 inches long; flowers white; found in Rocky Mountains ..... *J. americana.*
Shrubs usually less than 3 feet high; leaves ½ to 1¼ inches long; flowers deep pink; found in California ..... Var. *californica.*

CLIFFBUSH (*Jamesia americana* T. & G.).—Diffusely branching shrub 3 to 6 feet high; leaves elliptic to oval, ¾ to 2 inches long, with one main vein from base and prominent lateral veins, green above, densely white-hairy below, the margins coarsely toothed; flowers borne in small dense clusters at the ends of the branchlets, white, the petals 5, ¼ to ½ inch long; capsules slender-beaked, splitting from the top into 3 to 5 (or 7) sections; seeds many.

Occurrence.—ROCKY MOUNTAIN, 8,400 to 10,700 feet: northwest of Estes Cone. ZION.

CALIFORNIA CLIFFBUSH (Var. *californica* (T. & G.) Jepson.—Differs from the species in being a smaller, sometimes trailing shrub ½ to 3 feet high, with reddish or grayish stems, smaller leaves ½ to 1¼ inches long, and rose-pink flowers.

Occurrence.—KINGS CANYON: Harrison Pass trail. SEQUOIA, common on the east side, 8,500 to 12,000 feet: Hamilton Creek; Kern-Kaweah River; Kaweah Peaks; White Chief Mountain; Mount Whitney; Mineral King region.

SAXIFRAGE FAMILY (Saxifragaceae)

CURRANTS AND GOOSEBERRIES (*Ribes* L.)

The generic name, *Ribes,* is apparently derived from *ribas,* the Arabic name for a species of rhubarb (*Rheum ribes*), from which a famous Arabic syrup was made. Later, a similar-tasting syrup made in Europe from the berries of red currants was also called "ribas." [17] The name *Ribes* as applied to this group of shrubs was published by Linnaeus in 1737.

Currants and gooseberries are widely distributed and abundant in the United States, and many species are represented in the western national parks. The plants are easily recognized in Summer and Fall by the characteristic berries with which everyone is familiar. Ordinarily, the gooseberry bushes, because of their spiny or prickly stems, may be readily distinguished from the smooth-stemmed currants. There are, however, several exceptions to this rule in the parks, namely, two species of prickly stemmed currants, prickly currant (*R. lacustre*) and gooseberry currant (*R. montigenum*), and one gooseberry, white-stemmed gooseberry (*R. inerme*), whose stems are sometimes without spines or prickles. The fruits offer the surest means of distinguishing between the two groups of Ribes. Gooseberries break away from the stems with short stalks attached to the berries, while currant fruits break

17 Range Plant Handbook, B 130: United States Department of Agriculture, Forest Service. 1937.

away with no such stems attached. Some species of gooseberry have spiny berries but the currant fruits are either smooth or merely glandular-hairy.

Ribes species are widely variable in their habitat preferences. Some favor moist shaded sites along streams in the forests while others prefer dry sunny hillsides. Certain species occur at low altitudes in semi-desert areas while others grow at high altitudes near timberline. The herbage of several species is browsed to some extent by deer and elk. The berries are an important source of food for many birds and small animals, and were gathered and dried by the Indians. Even today, berries of some of the better-flavored species are collected by local residents for pies, jams and jellies.

Currants and gooseberries are of particular interest in those parks where five-needled white pines occur because of an introduced fungus disease, white pine blister rust (*Cronartium ribicola*), which has become prevalent over much of the western United States. The currant and gooseberry bushes act as alternate hosts to this fungus which attacks and kills the white pines. In areas where western white pine (*Pinus monticola*) or any other five-needled pine is an important forest tree the more susceptible species of gooseberry and currant are being removed. This destruction of the Ribes interrupts the life cycle of the rust and is the only practical method known for controlling the disease and saving the white pines.

FIELD GUIDE TO THE SPECIES

A. STEMS WITHOUT SPINES OR PRICKLES; FRUITS FALLING FROM THE BRANCHLETS WITHOUT STEMS ATTACHED.

Flowers saucer-shaped or shallowly cup-shaped, about 1/4 inch across; leaves 1/2 to 10 inches across.

Plants erect or spreading (sometimes more or less reclining in *R. laxiflorum*); berries purple-black.

Leaves large, up to 10 inches across; flower-clusters becoming 5 to 9 inches long; flowers greenish ..... 1. *R. bracteosum.*

Leaves smaller, 1/2 to 5 inches across; flower-clusters 1 to 4 1/2 inches long; flowers white or purplish.

Berries smooth, gland-dotted but not hairy; flowers white.

Leaves with petioles often longer than the blades; flower-clusters 2 to 4 1/2 inches long; found in parks of the Northwest ..... 2. *R. petiolare.*

Leaves with petioles shorter than the blades; flower-clusters 1 to 2 1/2 inches long; found on Isle Royale ..... 3. *R. hudsonianum.*

Berries covered with gland-tipped hairs; flowers purplish, the petals red ..... 4. *R. laxiflorum.*

Straggling shrubs with prostrate or reclining stems; berries red.

Leaves 1 1/2 to 4 inches across, 3- to 5- (or 7)-lobed; flowers white, pinkish, or purplish; found at Mount Rainier or on Isle Royale.

Flowers white or pinkish, borne along slender erect stems; berries with gland-tipped hairs ..... 5. *R. glandulosum.*

Flowers purplish, borne along slender nodding stems; berries smooth ..... 6. *R. triste.*

Leaves ½ to 1½ inches across, 3-lobed; flowers yellow; found at Crater Lake ..... 7. *R. erythrocarpum.*

Flowers bell-shaped or tubular; leaves ½ to 3 inches across.

Flower-clusters about 1 inch long, not stalked or scarcely so, few-flowered; flower-tubes 2 to 6 times as long as the lobes; leaves ½ to 1¼ inches across.

Flowers yellow, ½ to 1 inch long; leaves more or less fan-shaped, 3-lobed, the margins few-toothed, smooth; berries yellow, reddish, or dark purple, smooth or glandular-hairy; found in Rocky Mountains and Southwest ..... 8. *R. aureum.*

Flowers greenish-white to pinkish-lavender; leaves roundish, the margins irregularly toothed, glandular-hairy; berries bright red, gland-dotted or glandular-hairy; widespread species ..... 9. *R. cereum.*

Flower-clusters 1 to 4 inches long, distinctly stalked; flower-tubes ½ to 2 times as long as lobes; leaves 1 to 3 inches across.

Flowers greenish-white or tinged with pink; widespread species ..... 10. *R. viscosissimum.*

Flowers pink to red; found on Pacific slope.

Leaves thickish, green and thinly hairy above, paler and usually hairy below, somewhat glandular; flowers scattered loosely along flowering-stems; found in parks of the Northwest ..... 11. *R. sanguineum.*

Leaves thinnish, green and smooth on both sides or very finely glandular-hairy; flowers bunched near outer ends of flowering-stems; occurs in Sierra Nevada ..... 12. *R. nevadense.*

B. STEMS USUALLY ARMED WITH SPINES AND SOMETIMES PRICKLY.

Spines several below the leaves, or sometimes none; stems usually prickly between the nodes; flowers saucer-shaped, greenish or purplish-red, borne in several- to many-flowered clusters; berries falling from stems without stalks.

Berries red; leaves dull green and more or less glandular hairy on both sides ..... 13. *R. montigenum.*

Berries purple-black; leaves dark green, smooth or sparingly hairy ..... 14. *R. lacustre.*

Spines 1 to 3 below the leaves, or sometimes none; stems not usually prickly between the nodes; flowers bell-shaped or tubular, color various, borne singly or in groups of 2 to 6; berries falling with short stalks attached.

Berries smooth, hairy, or bristly with gland-tipped hairs.

Flowers ½ to 1 inch long, dark reddish-purple.

Flowers nearly 1 inch long; berries densely covered with short gland-tipped hairs; found in parks of the Northwest ..... 15. *R. Lobbi.*

Flowers mostly ¾ inch or less long; berries covered with gland-tipped hairs and short stiff bristles; found in Sierra Nevada ..... 16. *R. amarum.*

Flowers ¼ to 1/3 inch long, whitish, greenish, or yellowish, sometimes tinged with violet; widespread species.

Flower-tubes smooth or thinly hairy; berries smooth.

Leaves ¾ to 2 inches across.

Calyx-lobes about twice as long as tube, shorter than the stamens; found in the Northwest ..... 17. *R. divaricatum.*

Calyx-lobes about as long as the tube, as long as or slightly longer than the stamens; widespread species.

Leaves mostly wedge-shaped or straight at the base; stems usually with spines and also prickles; berries red .....18. *R. oxyacanthoides.*

Leaves mostly heart-shaped at base; spines often none; prickles none; berries reddish-purple to black .....19. *R. inerme.*

Leaves 1/4 to 3/4 inch across.

Rigidly-branched shrub 1 to 6 feet high .....20. *R. leptanthum.*

Straggly shrub with spreading stems 1 to 2 1/2 feet long ....21. *R. setosum.*

Flower-tubes finely and softly fuzzy; leaves 1/2 to 3/4 inch across; berries usually finely and softly fuzzy .....22. *R. velutinum.*

Berries densely bristly with stiff spines.

Flowers red, 1/2 to 1 inch long; leaves 1/2 to 1 inch across; spines on berries usually red or brown; common in Sierra Nevada of California .....23. *R. Roezli.*

Flowers greenish, about 1/3 inch long; leaves 3/4 to 2 1/4 inches across; fruit spines straw-colored; species of uncommon occurrence.

Plants erect; found at Mount Rainier National Park ....24. *R. Watsonianum.*

Plants with trailing stems.

Leaves and young shoots finely hairy; found at Crater Lake ....25. *R. binominatum.*

Leaves and young shoots glandular-hairy; found at Sequoia National Park .....26. *R. tularense.*

1. STINK CURRANT (*Ribes bracteosum* Dougl.).—Erect shrub 3 to 8 (or 14) feet high, the herbage with a strong, rather musky mint-like odor; leaves large and maple-like, 3 to 8 (or 10) inches across, on long stalks, smooth and green above, covered with gland dots below; flowers saucer-shaped, greenish, borne in the upper leaf-axils in erect or spreading clusters 5 to 8 inches long; berries dark purple or black, coated with a whitish film and covered with sticky resin dots, about 1/3 inch in diameter, unpleasantly flavored and not edible; common along stream banks in the woods or in moist open burns, often forming dense thickets.

The specific name, *bracteosum,* supposedly comes from the leaf-like bracts along the lower part of the flower stalk. This species is one of the most susceptible to white pine blister rust at Mount Rainier National Park.

Occurrence.—OLYMPIC, common in the forests up to 4,000 feet: Mount Angeles; Low Divide; Elwha River; Olympic Hot Springs; Quinault River; Canyon Creek; Duckabush River. MOUNT RAINIER, common along streams in the forests, 2,000 to 5,000 feet: Nisqually Valley; Cowlitz Canyon; Stevens Canyon; south of Mowich Lake.

2. WESTERN BLACK CURRANT (*Ribes petiolare* Dougl.).—Erect or spreading shrub 3 to 5 feet high; leaves 1 to 4 inches across, maple-like, nearly smooth or with a few hairs, covered below with gland dots; flowers white, shallowly cup-shaped, with tiny petals, borne in erect clusters 1 to 4 inches long; berries 1/4 to nearly 1/2 inch in diameter, dark purple or black, covered with gland dots.

Western black currant is found in the Rocky Mountains commonly along

streams in the aspen and spruce forests, but it may also occur in wet places on exposed rocky hillsides. The species name, *petiolare*, refers to the long leaf-stalks characteristic of the plant. Deer and elk utilize the herbage during the Fall and may even eat the small shoots and twigs during the Winter. The berries have a peculiar musky odor and are obnoxious to humans, but are eaten with relish by birds and small mammals. The unpleasant odor probably explains why this species is sometimes known as dog currant.[18]

This species is scarcely more than a variety of the following species and is considered by some as synonymous with it.

Occurrence.—YELLOWSTONE: Mammoth; near Rustic Falls between Mammoth and Norris Junction. GRAND TETON, 6,000 to 8,500 feet: Death Canyon; ridge between Open Canyon and Granite Canyon; Wilson road near entrance to J. Y. Ranch; Cascade Canyon trail; trail north of Bearpaw Lake.

3. HUDSON BAY CURRANT (*Ribes hudsonianum* Rich.).—Erect shrub; leaves broader than long, 1¼ to 4 inches wide, 3- to 5-lobed, the lobes coarsely toothed, hairy and resinous-glandular below; the leaf-stems shorter than the blades, flowers white, hairy, scattered along slender erect stems 1 to 2½ inches long; berries purple-black, gland-dotted.

Occurrence.—ISLE ROYALE: cedar swamp near Pickerel Cove.

4. TRAILING BLACK CURRANT (*Ribes laxiflorum* Pursh).—Erect shrub 3 to 6 feet high or the stems more or less prostrate; bark smooth, often copper-colored; leaves maple-like with heart-shaped base and toothed margins, smooth and shiny above, somewhat hairy and gland-dotted below, 1½ to 5 inches across; flowers saucer-shaped, about ¼ inch across, purplish, borne in spreading or erect several-flowered clusters 1½ to 4 inches long; sepals smooth; berries dark purple-black with a bloom, small, not usually over ¼ inch in diameter, covered with gland-tipped hairs; occurs in moist locations. (Syns. *R. Howelli* Greene, *R. acerifolium* Howell.)

Occurrence.—OLYMPIC, common, 4,000 to 6,000 feet; Mount Angeles; head of Duckabush River; Marmot Pass; Lake Constance; Seven Lakes Basin; source of Boulder Creek, 5 miles above Olympic Hot Springs. MOUNT RAINIER, abundant, 4,500 to 8,000 feet: Goat Mountain; Lodi Creek; Huckleberry Creek; Grand Park; trail to Reflection Lake; Mystic Lake; near snout of Nisqually Glacier; Mazama Ridge.

4a. COLORADO BLACK CURRANT (Var. *coloradense* (Cov.) Jancz.).—A decumbent or prostrate shrub differing from the species in having glandular-hairy sepals and berries without a bloom. (Syn. *R. coloradense* Cov.)

Occurrence.—ROCKY MOUNTAIN, occasional at high elevations: Moraine Park.

ROTHROCK CURRANT (*Ribes Wolfi* Rothr.) has been reported from Rocky Mountain National Park. This is also a black currant differing from Colorado black currant in having the leaves less deeply lobed and the berries usually with a bloom.

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18 Range Plant Handbook, B 132: United States Department of Agriculture, Forest Service. 1937.

5. SKUNK CURRANT (*Ribes glandulosum* Weber), fig. 32.—Low shrubs with prostrate stems and spreading or ascending branches; young herbage sparingly hairy and glandular, with a strong fetid odor when crushed; leaves 5- to 7-lobed, heart-shaped, 1¼ to 3½ inches wide, the margins sharply toothed, the leaf-stems about as long as the blades; flowers 8 to 12, borne along slender ascending stems, white or pinkish, glandular, the petals much longer than broad; berries red, glandular-bristly. (Syn. *R. prostratum L'Hér.*)

Occurrence.—ISLE ROYALE, common in cedar swamps, bog forests, and on lake shore rocks: Mott Island; Scoville Point; near Lake Desor.

Fig. 32. Skunk currant (*Ribes glandulosum*).

6. AMERICAN RED CURRANT (*Ribes triste* Pall.), fig. 33.—Straggling shrub with spreading or creeping stems, often rooting where they lie along the ground; leaves thinnish, roundish, heart-shaped at base, 3- to 5-lobed, the margins coarsely toothed, smooth above and below or hairy below; leaf stems mostly shorter than the blade; flowers saucer-shaped, purplish, the tiny petals red, borne on old wood below the leafy tufts in nodding clusters 1 to 1½ inches long; berries red, smooth, not glandular-hairy. Similar to western black currant except for the smooth red berries.

Fig. 33. American red currant (*Ribes triste*).

Occurrence.—MOUNT RAINIER, reported: Chinook Pass, 6,000 feet. ISLE ROYALE, common in moist woods: Mott Island; Sumner Lake; Washington Harbor; near Lake Desor.

7. CRATER LAKE CURRANT (*Ribes erythrocarpum* Cov. & Leib.).—Low, straggling shrub, 4 to 8 inches high, with trailing stems rooting at

the joints; herbage with a strong odor; leaves roundish, heart-shaped, more or less sticky-hairy, green above, paler below, about ½ to 1½ inches across, divided into 3 broad teeth; flowers saucer-shaped, yellow, dotted with red, borne in loose, erect clusters in the upper leaf-axils; berries red, covered with gland-tipped hairs; common around Crater Lake, Oregon, and restricted to that region.

Occurrence.—CRATER LAKE, abundant in the hemlock forests up to 7,000 feet: Pole Bridge Creek; slopes above Castle Crest.

8. GOLDEN CURRANT (*Ribes aureum* Pursh).—Smooth shrub 3 to 9 feet high; leaves smooth and pale, small, ½ to 1¼ inches wide, with 3 broad, more or less rounded lobes, sometimes with few-toothed margins; flowers golden-yellow, tubular, spicy-fragrant, ½ to 1 inch long, few in loose clusters about 1 inch long; berries yellow, reddish or black, smooth or slightly glandular-hairy, about ½ inch in diameter, juicy and well-flavored; occurs commonly along water courses at low and middle altitudes. The species is quite attractive and is sometimes grown as an ornamental.[19] (Syn. *Ribes longiflorum* Nutt., as to Rocky Mountain parks and west.)

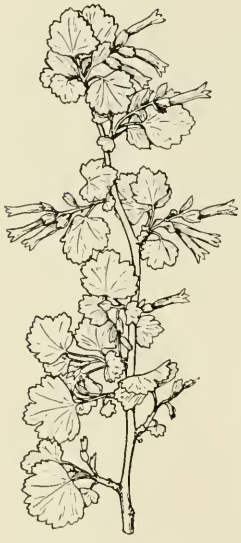

Fig. 34. Wax currant (*Ribes cereum*).

Occurrence.—GRAND TETON. ROCKY MOUNTAIN, rare: near Estes Park. MESA VERDE: lower Soda Canyon, 6,000 feet. BRYCE. ZION.

9. WAX CURRANT, SQUAW CURRANT (*Ribes cereum* Dougl.), fig. 34.—Rigid, very intricately-branched shrub, 1 to 6 feet high, with musky, fragrant herbage; leaves dull green in color, more or less roundish, ½ to 1¼ inches across, scarcely 3- to 5-lobed, the margins rather finely toothed; flowers greenish-white or pinkish, ½ to ¾ inch long, the long, slender tubes finely hairy, the lobes 1/6 to ¼ as long as the tube; flower clusters short, about 1 inch long, few-flowered; berries bright red, smooth, glandular-dotted or with fine gland-tipped hairs, edible, but rather insipid or even nauseating. This is one of the most widely distributed of western currants. It occurs commonly on dry slopes and ridges, frequently in association with such shrubs as big sagebrush, bitterbrush, choke cherries, service berries, and rabbitbrushes. Deer and elk utilize the twigs of this species to some extent, particularly during the winter. The small bright-red berries were sometimes gathered by the Indians, but are not of good-flavor. They are extensively eaten by birds and rodents, however. (Syn. *Ribes inebrians* Lindl.).

Occurrence.—CRATER LAKE, abundant, 5,400 to 7,200 feet: spring between Pole Bridge and lower campgrounds; near south entrance; Kerr Notch; Mount Scott. LAS-

19 Range Plant Handbook, B 130: United States Department of Agriculture, Forest Service. 1937.

SEN, 6,000 to 8,500 feet: near Lassen Buttes; Prospect Peak; Cinder Cone. YOSEMITE, common, 5,500 to 11,000 feet: White Mountain; west slope of Mount Gibbs; Mono Pass; Mount Dana; slope above Fletcher Lake; Tuolumne Meadows; along Tioga road above Aspen Valley; ¼ mile northeast of Alder Creek ranger station. KINGS CANYON, common in higher mountains: General Grant grove; Harrison Pass trail. SEQUOIA, 5,500 to 12,000 feet: outlet of Lion Lake; west of Little Baldy; lower Bearpaw Meadow; Redwood Meadows; Whitney Meadows; Mount Whitney (along west trail); Kern Canyon, 1 mile north of Rocky Creek; Big Arroyo; Farewell Gap; Kearsarge Pass; along General's Highway towards northwest corner of park. YELLOWSTONE, occasional: Gardiner; Mammoth Hot Springs; Upper Geyser Basin. ROCKY MOUNTAIN, common, 7,500 feet to timberline: Estes Park. BRYCE CANYON, common, 6,000 to 9,100 feet: Bryce Point; Farview Point; Inspiration Point; Rainbow Mountain. ZION. GRAND CANYON, 5,600 to 7,000 feet. North Rim, common: head of North Canyon; Neal Spring; Cape Royal. South Rim, common: El Tovar; Yavapai Point; east of Grand View; Pasture Wash; along Rim Drives. Canyon, common: upper Bass Canyon; Kaibab trail on switchbacks below Tip off; Bright Angel trail; Hermit trail.

10. STICKY CURRANT (*Ribes viscosissimum* Pursh), fig. 35.—Spreading, somewhat stiffly-branched shrub, 1 to 3 feet high, with shreddy bark and fragrant sticky foliage; leaves roundish, heart-shaped, 1 to 2½ inches wide, usually with 3 broad rounded lobes, the margins toothed; flower-tubes broad, greenish or pinkish-lavender, with 5 lobes half as long as the tube, borne in several-flowered clusters 1 to 3 inches long; berries oval, usually ribbed lengthwise, black, smooth or sticky-hairy, about 1/3 to ½ inch in diameter; usually found scattered in open pine, fir, and spruce woods, but sometimes associated with brush species in dry rocky places. The foliage is of some importance as a browse for elk and deer, especially during the Fall and Winter. The dry, seedy berries have little pulp but are eaten to some extent by wildlife.

Fig. 35. Sticky currant (*Ribes viscosissimum*).

A variety with smooth berries has been designated variety *Halli* Jancz.

Occurrence.—MOUNT RAINIER, are in northeast part of park up to 5,000 feet: below White River ranger station; near Yakima Park highway on slope of Sunrise Ridge; Lodi Creek. CRATER LAKE, common, 4,000 to 7,000 feet: Annie Creek; rim road to Lost Creek. LASSEN. YOSEMITE, occasional, 5,000 to 9,500 feet: Yosemite Creek trail near Yosemite Falls; Pohono trail; Little Yosemite; McClure Fork, Merced River; Porcupine Flat; Eagle Peak Meadows; Matterhorn Canyon; Starr King Meadow. KINGS CANYON: General Grant Grove. SEQUOIA, common, 6,000 to 9,500 feet: near Redwood Meadows; Hockett Meadows; Kaweah Meadows; near Mineral King. GLACIER, common, 3,100 to 5,500 feet: Lake McDonald; trail to Mount Brown lookout;

Nyack Creek; Bowman Lake; Swiftcurrent Lake; Crossley Lake; Otokomi Lake trail. YELLOWSTONE, common: east entrance; near Beryl Spring; near Rustic Falls; south of Norris Junction; near Mammoth Hot Springs; Crescent Hill. GRAND TETON, occasional: Jackson Lake, 6,800 feet. GRAND CANYON, reported, but probably mistaken identity.

11. WINTER or RED FLOWERING CURRANT (*Ribes sanguineum* Pursh).—A beautiful shrub 3 to 9 feet high, with slender, erect or spreading stems; bark brownish, shreddy; leaves soft, with fine hairs, dark green above, often whitish below, 1¼ to 3 inches wide, with 3 to 5 broad lobes, the margins finely toothed; flower tubes light pink to deep red, with 5 spreading lobes, the tiny petals white; flowers borne in loose or rather dense several- to many-flowered clusters 2 to 4 inches long; berries blue-black, with a bloom, more or less glandular, dry and large-seeded but the flavor sweet and agreeable; occurs on banks and rocky slopes in the mountains, often forming thickets. This species is a handsome ornamental and is widely cultivated.

Occurrence.—OLYMPIC, common at the lower elevations: Duckabush River; Wild Rose Creek, near Elwha River, 2,000 feet. MOUNT RAINIER, common: near White River ranger station. CRATER LAKE, rare: lower Redblanket Creek at southwest corner of park.

12. SIERRA CURRANT (*Ribes nevadense* Kell.).—Smooth, slender shrub 3 to 6 feet high; leaves 1½ to 3 inches wide, roundish-heart-shaped with 3 to 5 short broad lobes, the margins finely toothed, green and smooth above and below or finely hairy below; flowers reddish, with 5 erect lobes, borne in spreading or drooping several- to many-flowered clusters, these 2 to 4 inches long; berries blue-black with a bloom, somewhat sticky-hairy, about 1/3 inch in diameter; occurs in the mountains of California at middle altitudes.

Occurrence.—LASSEN: Manzanita Lake, 5,800 feet. YOSEMITE, 4,000 to 7,000 feet: near Happy Isles, Yosemite Valley; Vernal Falls; Hetch Hetchy Valley; along road to Glacier Point; Mariposa Grove of bigtrees; Peregoy Meadow; Isberg Pass trail. KINGS CANYON: near Sphinx Creek; General Grant Grove. SEQUOIA, occasional, 6,000 to 7,000 feet: Giant Forest; Garfield Grove of bigtrees; Atwell Mill: west of Panorama Point.

13. GOOSEBERRY CURRANT (*Ribes montigenum* McCl.).—Low, freely-branching shrub 1 to 4 feet high, the stems with 1 to several spines below the leaves and usually prickly between (sometimes smooth); leaves small, 1/3 to 1 inch across, finely glandular-hairy, deeply divided into 3 to 5 lobes, the margins toothed; flowers greenish or reddish-brown, saucer-shaped, with tiny red petals, borne in several-flowered clusters; berries about ¼ inch in diameter, bright red to purple, covered with gland-tipped hairs. This species is chiefly a high mountain form, sometimes abundant along the edges of sub-alpine meadows. The plant offers fair forage for deer and elk. The berries are much relished by grouse and other birds and are occasionally collected for pies. . (Syn. *Ribes lentum* (Jones) Cov. & Rose).

Occurrence.—LASSEN, common, 6,000 to 8,000 feet: Brokeoff Mountain; near Sulphur Works; Diamond Peak on Loop Highway; Summit Lake; Eagle Peak; shoulders of Lassen Peak. YOSEMITE, abundant, 8,000 to 11,000 feet: Mount Hoffman; Mount Lyell; Tioga Pass; Donohue Pass; Mono Pass; Cathedral Pass trail; Starr King Meadows; above Fletcher Lake; Porcupine Flat; Tuolumne Meadows; Gaylor

Lake trail; Lake Tenaya. KINGS CANYON, common: East Lake. SEQUOIA, common, 9,000 to 12,000 feet: Kearsarge Pass; Harrison Pass; Mount Whitney; Hockett Meadows. YELLOWSTONE: along Spring Creek; near Rustic Falls between Mammoth and Norris Junction; Old Faithful. GRAND TETON, occasional, 7,000 to 8,500 feet: head of Death Canyon; Granite Canyon; Waterfall Canyon. ROCKY MOUNTAIN: near Poudre Lakes, 10,800 feet. ZION: Horse Pasture Plateau, 7,250 feet. GRAND CANYON.

14. PRICKY CURRANT (*Ribes lacustre* (Pers.) Poir.), fig. 36.—Stout shrub with spreading or nearly prostrate stems 3 to 4 feet long; stems with 3 to 5 (or 9) short stout spines below the leaves and usually very prickly between; leaves ¾ to 2½ inches across, smooth, nearly without hairs, divided into 5 to 7 lobes, the margins toothed; flowers greenish or purplish, saucer-shaped, borne in more or less drooping, several-flowered clusters 1 to 3 inches long, the flower-stalks glandular-hairy; berries purple-black, currant-like, small, covered with gland-tipped hairs; occurs in moist woods, along streams, in sub-alpine meadows, or on moist rocky slopes. (Syn. *Ribes parvulum* Rydb.).

Occurrence.—OLYMPIC, abundant, 1,500 to 5,000 feet: Mount Angeles; Olympic Hot Springs; Elwha River; Mount Colonel Bob; Lake Constance; trail to Constance Ridge. MOUNT RAINIER, 4,500 to 6,000 feet; trail to Berkeley Park; Grand Park; Paradise Park; along trail near Spray Falls, road to Yakima Park; Huckleberry Creek; upper valley of the Nisqually. CRATER LAKE, 4,000 to 5,000 feet: southwest

Fig. 36. Prickly currant (*Ribes lacustre*).

side of Crater Lake near lake shore trail; 2 miles southwest of Oasis Butte; canyon east of highway at old south boundary of park; Castle Crest; Wizard Island. GLACIER, abundant, 3,000 feet to timberline: Lake McDonald; Swiftcurrent Lake; Josephine Lake; trail to Iceberg Lake; Cracker Lake trail; Two Medicine Valley; Cut Bank Valley; St. Mary Lake and Valley; Avalanche Lake. YELLOWSTONE, common: Sylvan Pass; top of trail to lower Yellowstone Falls; Canyon Junction; Tower Falls; Soda Butte Creek. GRAND TETON: north of Bear Paw Lake, 7,300 feet. ROCKY MOUNTAIN, occasional at higher elevations: north of Mount Acoma. ISLE ROYALE: Tobin Harbor trail; Duncan Bay; near Lake Desor; Washington Island.

15. LOBB'S GOOSEBERRY, GUMMY GOOSEBERRY (*Ribes Lobbi* Gray).—Bush 2 to 6 feet high, the stems with 3 stout spines below the leaves; leaves roundish, divided into 3 broad lobes with toothed edges; somewhat glandular-hairy; flowers showy, 1/2 to 1 inch long, bright crimson, tube-like, with 5 backwardly curled lobes, the petals white, borne singly or in 2's or 3's on nodding stems; berries brownish-red, ovoid, about 1/2 to 2/3 inch long, densely covered with short, stiff, gland-tipped hairs, edible; occurs in the higher mountains of the Pacific slope. The flowers and fruits of this plant are very handsome.

Occurrence.—OLYMPIC: Hurricane Creek. MOUNT RAINIER, rare: upper Nisqually Valley. CRATER LAKE, rare, along western boundary: Crescent Ridge, about 5,500 feet.

16. BITTER GOOSEBERRY (*Ribes amarum* McClatch.).—Erect shrub very similar to gummy gooseberry but with usually smaller flowers; leaves thinnish, about 1/4 to 3/4 inch across, more or less glandular-hairy on both sides; flowers narrowly bell-shaped, purplish, the petals pinkish-white, borne singly or in 2's or 3's on short stems; berries 1/2 to 3/4 inch in diameter, densely covered with gland-tipped hairs; and also short stiff straw-colored spines; berries of good flavor, but the glandular secretion bitter.

Fig. 37. Canada gooseberry (*Ribes oxyacanthoides*).

Occurrence.—YOSEMITE: occurs on Chowchilla Mountain just west of park boundary (southwest corner), probably occurs inside. SEQUOIA, up to 4,000 feet: Mineral King road.

17. STRAGGLY GOOSEBERRY (*Ribes divaricatum* Dougl.).—Shrub 4 to 12 feet high with long, straggly branches and dull gray or whitish bark; spines 1 to 3 below each leaf, the stems sometimes with a few scattered prickles between; leaves roundish with 3 to 5 broad lobes and with toothed margins, green above, paler and hairy below 3/4 to 2 inches wide; flowers small, inconspicuous, bell-shaped, smooth or thinly hairy, pale green or with purplish lobes, the tiny petals white and the stamens 3 to 4 times as long as the petals, borne in clusters of 2 to 6; berries purple or bluish-black, smooth, about 1/4 to 1/3 inch in diameter, of excellent flavor; common in wet open places, often forming thickets.

Occurrence.—OLYMPIC: Elwha River near Elkhorn Guard Station; Hurricane Ridge. MOUNT RAINIER: upper Nisqually Valley.

18. CANADA GOOSEBERRY (*Ribes oxyacanthoides* L.), fig. 37.—Low shrub, the branches slender, often reclining, with mostly 3 stout short spines at base of the leaves and usually prickly between; leaf-blades mostly squared or wedge-shaped at base, ¾ to 1¾ inches across, deeply 5-lobed with toothed margins, slightly hairy or nearly smooth; flowers borne on slender stems in the leaf-axils, 1 or 2 to a stem, greenish-white to yellowish or dull purplish, the sepals little longer than the tube; stamens and petals 2/3 as long as the sepals; berries smooth, red.

Occurrence.—ISLE ROYALE: Mott Island; Greenstone Island; Grace Harbor.

Fig. 38. Whitestem gooseberry (*Ribes inerme*).

19. WHITESTEM GOOSEBERRY (*Ribes inerme* Rydb.), fig. 38.—Slender-stemmed shrubs with spines 1 to 3 below each leaf or often none; leaves smooth on both sides or sparingly hairy below; flowers greenish or purplish, 1 to 4; stamens about twice as long as tiny petals; berries reddish-purple to black, smooth, about ¼ inch in diameter, of good flavor. (Syn. *R. saxosum* Hook.) The shrubs usually occur in thickets along streams, often tangled with willows. The foliage furnishes fairly good forage for deer.

Occurrence.—CRATER LAKE: Sand Creek at mouth of Wheeler Creek; Annie Creek near south entrance to park. LASSEN. YOSEMITE: Mono Pass; Lyell Fork Tuolumne River; Bloody Canyon; Boundary Hill region near edge of cirque. SEQUOIA: Mineral King. GLACIER, common, 3,000 to 5,000 feet: Lake McDonald; Avalanche Lake; St. Mary Lake; Swiftcurrent Creek; Josephine Lake; Cracker Lake trail. YELLOWSTONE, occasional: near east entrance; Slough Creek. GRAND TETON: Waterfall Canyon, 7,800 feet. ROCKY MOUNTAIN: southwest of Mount Bryant, 8,500 feet. GRAND CANYON, occasional on North Rim, 6,300 to 8,800 feet: Point Imperial.

HAIRYSTEM GOOSEBERRY (*Ribes hirtellum* Michx.), reported from Rocky Mountain National Park, but can scarcely be distinguished from whitestem or Canada gooseberry.

20. TRUMPET GOOSEBERRY (*Ribes leptanthum* Gray), fig. 39.—Low, rounded, rigidly-branched shrub 1 to 6 feet high, the branches sometimes bristly; stems with 1 to 3 stiff spines 1/3 to 2/3 inch long below the leaves; leaves roundish, small, ¼ to ¾ inch across, divided into 3 to 5 toothed lobes, smooth or somewhat hairy; flowers greenish-white, finely hairy to nearly smooth, tubular, ¼ to ½ inch long, 1 to 2 on short stems; berries

Fig. 39. Trumpet gooseberry (*Ribes leptanthum*).

crimson or dark purple, smooth or with gland-tipped hairs, 1/4 to 2/3 inch in diameter.

Occurrence.—MESA VERDE, rare: head of Navajo Canyon. GRAND CANYON, 5,500 to 9,100 feet. North Rim, common in the canyons at edge of rim: Bright Angel Point; Point Sublime; Point Imperial; Cape Royal; Powell Plateau; Neal Spring. South Rim, common near rim: below Grand View; Yavapai Point. Canyon, common: Bright Angel trail; Kaibab trail about 1 1/2 miles below North Rim.

20a. WOOLLYFLOWER GOOSEBERRY (Var. *lasianthum* (Greene) Jepson).—Flowers yellow, the tubes hairy, borne in groups of 2 to 4; berries yellow or dark red, smooth or nearly so.

Occurrence.—LASSEN. YOSEMITE: Merced Lake; Lyell Fork Tuolumne River; Bloody Canyon; Mono Pass; Merced Lake trail. SEQUOIA, 7,000 to 11,000 feet: Farewell Gap; Hockett Meadows.

21. REDSHOOT GOOSEBERRY (*Ribes setosum* Lindl.).—Similar to trumpet Gooseberry, but smaller; stems spreading, 1 to 2 1/2 feet long, more or less prickly between the 3 stout spines; flowers 1 to 3 in a cluster, white, tinged with violet; berry smooth, red to black; occurs in moist locations in the Rocky Mountains. (Syn. *R. saximontanum* E. Nels.)

Occurrence.—YELLOWSTONE: Mammoth. ROCKY MOUNTAIN. ISLE ROYALE: reported by Holt on shore of Siskowit Lake.

22. DESERT GOOSEBERRY (*Ribes velutinum* Greene).—Somewhat similar in appearance to trumpet gooseberry; spines usually 1 below the leaves, long and slender; leaves small, deeply indented; flowers yellowish or whitish, bell-shaped, 1 to 4 on drooping stems; berries purplish, densely soft-fuzzy, about 1/6 to 1/4 inch in diameter; occurs on mountain slopes of the interior plateau region.

Occurrence.—GRAND CANYON, on the South Rim and below, 3,000 to 8,000 feet: Grand View road; Bright Angel trail.

23. SIERRA GOOSEBERRY (*Ribes Roezli* Regel.), fig. 40.—Stout, spreading shrub, 1 1/2 to 5 feet high; stems with 1 to 3 spines below the leaves, not prickly between; leaves usually 1/2 to 1 inch across, hairy or smooth, roundish or kidney-shaped, divided into 3 to 5 broad lobes, the margins toothed; flowers 1/2 to 1 inch long, the tube dark purplish-red, 1/2 to 3/4 inch long, more or less hairy, with 5 teeth as long as the tube;

Fig. 40. Sierra gooseberry (*Ribes Roezli*).

petals white, the anthers red or pinkish, the flowers borne singly (or in 2's) in the leaf-axils; berries yellowish, pinkish or purplish, or becoming red-brown when ripe, 1/2 to nearly 1 inch in diameter, covered with long, stiff spines sometimes 1/4 inch long, the spines finely hairy; occurs on slopes and canyon-sides at middle altitudes in the mountains of California where it is the most common gooseberry in the main timber belt.

Occurrence.—LASSEN, up to 7,000 feet: Hot Springs Valley; Lassen Peak. YOSEMITE, abundant, 4,000 to 7,000 feet; southeast of Wawona; near Chinquapin; Glacier Point; Big Meadow; Coulterville road 1 mile above All Year Highway; Yosemite Valley; Yosemite Creek trail above Falls; Pohono trail; Mirror Lake; foot of Vernal Falls; Merced Lake trail; Cascade Creek. KINGS CANYON: near Sphinx Creek; General Grant Grove. SEQUOIA, 5,000 to 7,800 feet: Marble Fork Kaweah River; Rejoicing Summit; General's Highway; Redwood Meadows; Redwood Creek; Atwell's Mill; vicinity of Mineral King.

23a. BLOOD SIERRA GOOSEBERRY (Var. *cruentum* (Greene) Rehd.).—Leaves and flowers smooth, not hairy; berries densely spiny, the spines not hairy nor glandular.

Occurrence.—CRATER LAKE, rare, near south and west boundaries: lower Redblanket Canyon; Crescent Ridge.

24. WATSON GOOSEBERRY, MT. ADAMS GOOSEBERRY (*Ribes Watsonianum* Koehne).—Erect shrubs 2 to 6 feet high, the stems smooth except for usually 3 stiff slender spines below the leaves; leaves very finely hairy, 3/4 to 2 inches across, divided into 3 to 5 broad lobes, the margins toothed; flowers borne singly or in 2's or 3's in the leaf-axils, the tubes greenish-white, bell-shaped, about 1/3 inch long, the 5 lobes 2 to 3 times as long as the shallow tube; petals white; berries densely covered with slender straw-colored spines; found only at Mount Rainier National Park.

Occurrence.—MOUNT RAINIER, rare, 4,500 to 5,500 feet: White River along the Yakima Park road; Sunrise Ridge.

25. SISKIYOU GOOSEBERRY (*Ribes binominatum* Hell.).—Stems trailing; young shoots finely hairy but not glandular; leaves about 3/4 to 2 1/4 inches across, deeply divided into 3 or sometimes 5 lobes, the margins toothed, finely hairy above, more densely so below, not glandular; flowers greenish-white, about 1/3 inch long, the 5 lobes about 2 to 3 times as long as the shallow tube; tiny petals white; berry about 1/3 inch in diameter, densely covered with stiff straw-colored spines, some of them nearly 1/4 inch long.

Occurrence.—CRATER LAKE: northwest of Crater Peak, 6,300 feet; Annie Creek at mouth of Pole Bridge Creek.

26. TULARE GOOSEBERRY (*Ribes tularense* (Cov.) Fedde).—Leaves and young shoots glandular-hairy; stems somewhat prickly between spines.

Occurrence.—SEQUOIA, rare. After its description from a collection made in the "Giant Forest" region, this species was lost sight of until it was recently discovered along the Colony Mill road at around 5,500 feet elevation.

ROSE FAMILY (Rosaceae)

The rose family as considered here is one of the largest of the families represented in the national parks, at least as far as the shrubby species are concerned. It also includes a large proportion of species with edible fruits. The family is characterized by usually showy flowers or rarely with the petals lacking.

FIELD GUIDE TO THE GENERA

A. PLANTS LOW, CREEPING, MOSTLY ALPINE; FLOWERING STALKS ERECT, 1 TO 9 INCHES TALL.

Flowers small, borne in dense oblong clusters; petals 5, scarcely 1/8 inch long, white; fruits tiny pods ..... PETROPHYTUM, p. 135.

Flowers large, usually borne singly; petals mostly 8, about 1/3 to 1/2 inch long, white or yellow; fruits small seed-like achenes with long white-fuzzy tails ..... DRYAS, p. 136.

B. PLANTS ERECT OR SPREADING, OR IF LOW AND CREEPING, NOT ALPINE DWARFS.

1. *Leaves compound* (divided into separate leaflets).

Stems not thorny nor prickly.

Leaves finely divided and fern-like.

Low shrub not over 2 feet high; leaves three times divided; herbage with strong aromatic odor ..... CHAMAEBATIA, p. 100.

Erect shrubs 2 to 6 feet high; leaves twice divided; herbage with sweetish odor when crushed. ..... CHAMAEBATIARIA, p. 100.

Leaves not fern-like.

Leaves oblong to elliptic, 2 1/2 to 8 inches long, usually with more than 5 leaflets; flowers white, borne in compact clusters; fruits apple-like ..... SORBUS, p. 109.

Leaves roundish, not more than 1 inch long, divided into 3 to 5 leaflets; flowers borne singly or in few-flowered clusters.

Erect or spreading shrubs; leaflets grayish-green, not toothed; flowers yellow; fruits tiny seed-like achenes ..... POTENTILLA, p. 101.

Shrubs with trailing stems; leaflets dark green, irregularly toothed; flowers white; fruits aggregate berries composed of several 1-seeded drupelets ..... RUBUS, p. 101.

Stems thorny or prickly.

Leaflets mostly egg-shaped, roughish, prominently veined; flowers white or dark red; fruits aggregate berries with many 1-seeded drupelets ..... RUBUS, p. 101.

Leaflets mostly elliptic to oblong, smooth, not rough, obscurely veined; flowers rose-pink; fruits apple-like ..... ROSA, p. 111.

2. *Leaves simple* (not divided into separate leaflets).

Stems with stout thorns; flowers white, borne in flattish clusters at the ends of the stems; fruits dark purple or red, apple-like ..... CRATAEGUS, p. 118.

Stems not thorny (the ends of the branchlets sometimes spine-tipped in one species of Prunus); flowers white, pink, or yellow, borne singly or in clusters; fruits various.

Leaves not leathery, never linear nor divided into linear lobes.

Flowers flat-spreading or saucer-shaped, the sepals persistent; petals present.

Flowers borne singly or in few- to many-flowered clusters, the petals mostly 1/4 to 1 inch long; fruits fleshy.

Leaves roundish, 3- to 5-lobed, the margins irregularly toothed; fruits raspberry-like ..... RUBUS, p. 101.

Leaves narrowly oblong to elliptic or roundish, not lobed, the margins often toothed; fruits apple-like or cherry-like.

Fruits apple-like (the flower-parts on the top of the fruit).

Leaves mostly narrowly elliptic or oblong to roundish, not bunched at the ends of the branchlets; flowers white ..... AMELANCHIER, p. 119.

Leaves narrowly oblong, tapering to both ends, tending to be bunched at the ends of the branchlets; flowers pink ..... PERAPHYLLUM, p. 123.

Fruits small cherries or plums (drupes).

Fruits borne singly in a flower; flowers all alike; widespread in the parks ..... PRUNUS, p. 124.

Fruits 1 to 5 to a flower; male and female flowers borne on separate plants; occurs in Pacific slope parks ..... OSMARONIA, p. 128.

Flowers borne in many-flowered clusters, the petals about 1/8 inch long or less; fruits tiny seed-like achenes or small dry pods.

Leaves roundish to kidney-shaped, heart-shaped, or egg-shaped, 3-5-lobed and irregularly toothed ..... PHYSOCARPUS, p. 128.

Leaves oblong to elliptic, egg-shaped or wedge-shaped, the margins usually toothed but not lobed.

Flowers white, the clusters loose, often drooping; leaves mostly elliptic to reverse-egg-shaped or wedge-shaped, mostly toothed above the middle; fruits tiny seed-like achenes ..... HOLODISCUS, p. 130.

Flowers white or pink, the clusters compact, stiffly erect, leaves mostly oblong to elliptic, mostly toothed along the sides; fruits tiny pods ..... SPIRAEA, p. 133.

Flowers with a long tube-like base; sepals falling in fruit; petals none; fruits small seed-like achenes with long white-fuzzy tails ..... *Cercocarpus betuloides*, p. 137.

Leaves mostly leathery, linear to oblong, spatula-shaped, club-shaped, or narrowly wedge-shaped, entire, deeply divided into linear lobes, or 3-toothed at the tip.

Flowers borne singly or in groups of 2 to several; not found in Sequoia National Park.

Leaves linear to narrowly oblong or club-shaped, not toothed nor divided, or sometimes with few small teeth; true petals none or soon falling.

Leaves alternate.

Flowers with narrow tube-like base; calyx lobes green, falling in fruit; leaves thick and leathery; fruits with long hairy tails ..... CERCOCARPUS, p. 137.

Flowers with deeply cup-shaped calyx; petals small, 5, soon falling; leaves thinnish, some of them few-toothed; fruits small, almond-like, hairy ..... *Prunus fasciculata*, p. 128.

Leaves opposite; flowers shallowly cup-shaped, the calyx lobes yellow inside; petals none; fruits dry, seed-like ..... COLEOGYNE, p. 141.

Leaves 3-toothed at tip or divided into several linear lobes; flowers with conspicuous petals.

Leaves lobed; flowers white; fruits with long white-fuzzy tails.
Bark usually reddish-brown; calyx without teeth or appendages between the sepals; fruits usually 5 ..... COWANIA, p. 141.
Bark usually light gray or whitish; calyx with lance-shaped or oblong teeth or appendages between the sepals; fruits many, packed into fluffy heads ..... FALLUGIA, p. 142.
Leaves 3-toothed at the tip; flowers yellow; fruits not tailed ..... PURSHIA, p. 143.
Flowers borne in large many-flowered clusters; occurs in Sequoia and Yosemite National Parks ..... ADENOSTOMA, p. 143.

BEARMAT, MOUNTAIN MISERY (*Chamaebatia foliolosa* Benth.).—Low, strongly aromatic, evergreen shrub ¾ to 2 feet high, with spreading branches and fern-like foliage; leaves about 1 to 3 inches long, several times divided into very fine leaflets, each tipped with a yellowish resin gland; flowers white, with 5 petals, resembling flowers of strawberries or blackberries; fruits small seed-like achenes.

Bearmat often forms extensive carpets in the open ponderosa pine forests of the Sierra Nevada. The strong aromatic odor, while fragrant and agreeable at a distance, is obnoxious to most people at close range. Because of this and also because of the sticky resinous leaves which often stain the clothing, the plant is sometimes called mountain misery. *Kit-kit-dizze* is the Indian name which has been adopted in some localities. The herbage is practically useless as a browse for animals.

Occurrence.—YOSEMITE, common, 4,000 to 6,500 feet: Chilnualna Creek; Ackerson Creek, north of Carl Inn; Mariposa Grove; Wawona; Chinquapin. SEQUOIA, abundant, 4,000 to 6,500 feet; near Colony Mill ranger station; Clough Cave; Giant Forest; Atwell Mill; Garfield Grove.

Fig. 41. Fernbush (*Chamaebatiaria millefolium*).

FERNBUSH, TANSYBUSH, DESERT-SWEET (*Chamaebatiaria millefolium* (Torr.) Maxim.), fig. 41.—Stout erect evergreen shrub 2 to 6 feet high with diffuse branches; leaves lance-shaped, 1 to 2½ inches long, 1/3 to ½ inch wide, twice divided into very fine leaflets; flowers white, 1/3 to ¾ inch across, 5-petalled, borne in conspicuous leafy clusters at the ends of the branches; fruits small several-seeded pods, borne 5 to a flower. The species favors dry rocky slopes. The foliage is of

not much importance as a browse for animals.

Occurrence.—LASSEN: trail to Lava Tubes. GRAND CANYON, 5,500 to 7,500 feet. North Rim, occasional at edge of the rim: Cape Royal; Cliff Spring. South Rim, common: El Tovar; Grand Canyon village; Yavapai Point; Yaki Point; along Rim Drives. Canyon, rare.

BUSH CINQUEFOIL (*Potentilla fruticosa* L.), fig. 42.—Low, widely-branching shrub, ½ to 4 feet high; leaves mostly ½ to 1 inch long, white-silky below, divided into 3 to 5 smaller, oblong leaflets; flowers ½ to 1 inch across, petals 5, bright yellow; fruits tiny seed-like achenes. (Syn. *Dasiphora fruticosa* Rydb.)

Fig. 42. Bush cinquefoil (*Potentilla fruticosa*).

Bush cinquefoil is widely distributed in the northern hemisphere, occurring in Europe, Asia, and over most of the northern and mountainous parts of North America. It is a very attractive shrub with bright yellow, buttercup-like flowers, growing typically in moist rocky subalpine meadows, or sometimes on dry slopes or in open forests. The bushes may be low and sprawling, or erect and becoming as much as 4 feet in height. The flowering period extends over a long time, often from early spring until late summer. The leaves, although rather coarse in texture and with an astringent taste, are abundant and of good size and are eaten to a certain extent by deer and elk.

Occurrence.—OLYMPIC: Low Divide; Mount Angeles. MOUNT RAINIER, occasional, 5,000 to 8,000 feet: Spray Park. YOSEMITE, 7,000 to 12,000 feet: Mount Dana; Mount Lyell; west of Stanford Peak; southeast of Onion Lake; Mono Pass. GLACIER, common, especially on the east slope, 4,500 to 7,500 feet: near Many Glacier Hotel; Iceberg Lake trail; upper Swiftcurrent Valley; trail to Grinnell Glacier; Logan Pass; Cut Bank Pass; Cut Bank Valley; Triple Divide Pass. YELLOWSTONE, occasional: Gibbon Falls; Gibbon Meadow, south of Norris; Mount Washburn. GRAND TETON, 6,000 to 8,500 feet: along road south of park headquarters; near head of Death Canyon. ROCKY MOUNTAIN, common, 8,700 feet and above: 1 mile northeast of Columbine Lake. BRYCE CANYON: Sevier River, East Fork. ISLE ROYALE, common in rock shore crevices: Scoville Point; Blake Point.

BLACKBERRY, RASPBERRY (Rubus L.)

Blackberries and raspberries are among the best known and most easily recognized of the wild shrubs because many of them so closely resemble the cultivated varieties. The familiar fruits are composed of tiny 1-seeded berries or drupelets which form a single layer around a central core or receptacle. Blackberries fall from the stems in the form of solid berries with the drupelets remaining attached to the central core, while the raspberries separate from the receptacles as hollow or cup-shaped berries. Fruits of many of the species are gathered extensively for canning and preserving.

FIELD GUIDE TO THE SPECIES

Stems herb-like, soft-woody at base; leaves roundish, 1 to 2 inches across; fruits red, composed of only a few drupelets.

Leaves simple, 3- to 5-lobed, irregularly toothed; berries finely hairy ..... 1. *R. lasiococcus.*

Leaves palmately divided into 3 to 5 separate leaflets; berries smooth.

Leaflets rounded at tips; flowers usually borne singly.

Flowers usually white; western species ..... 2. *R. pedatus.*

Flowers rose-color; eastern species ..... 3. *R. arcticus.*

Leaflets pointed at tips; flowers 1 to 3; eastern species ..... 4. *R. triflorus.*

Stems woody; leaves larger and coarser; fruits red or black, composed of many drupelets.

Stems trailing along the ground or climbing over bushes.

Leaves more or less hairy, mostly divided into 3 separate leaflets (the upper often not divided); stems densely armed with prickles; berries black ..... 5. *R. macropetalus.*

Leaves smooth, mostly not divided into separate leaflets; stems sparingly armed with prickles; berries red ..... 6. *R. nivalis.*

Stems erect or spreading, not trailing along the ground.

Leaves divided into separate leaflets; stems usually more or less prickly.

Flowers borne in elongate clusters; berries purple-black when ripe, not separating from central core; species rare in the parks.

Leaflets dissected into several pointed lobes; prickles curved ..... 7. *R. laciniatus.*

Leaflets not dissected; prickles straightish ..... 8. *R. frondosus.*

Flowers borne singly or few in flattish clusters; berries black, red, or salmon-colored, separating from central core or receptacle; species common.

Flowers dark red or purplish, solitary or few; berries ovoid, ½ to nearly 1 inch long, reddish to yellow or salmon-colored; stems unarmed or with only a few weak prickles; leaves not white-velvety below ..... 9. *R. spectabilis*

Flowers white, clustered; stems prickly; berries shallowly cup-shaped when separated from receptacle, about ½ inch across; leaves white-velvety below.

Berries black or purple, composed of numerous tiny closely-packed drupelets; prickles of flower-clusters strongly flattened and curved; young shoots long and spreading, covered with a conspicuous white bloom ..... 10. *R. leucodermis.*

Berries red; drupelets larger, fewer and less closely packed; prickles of flower-cluster straight, not flattened; young shoots not conspicuously long and spreading, the bark often reddish ..... 11. *R. idaeus* vars.

Leaves simple, 3- to 7-lobed but not divided into separate leaflets; stems not prickly.

Flowers usually several in a cluster; leaves 3 to 12 inches across; fruits bright red, juicy; widespread in the parks ..... 12. *R. parviflorus.*

Flowers usually solitary; leaves ¾ to 2½ inches across; fruits purplish, dryish; found in Rocky Mountain and Grand Canyon National Parks ..... 13. *R. deliciosus.*

1. HAIRY-FRUITED DWARF BRAMBLE (*Rubus lasiococcus* Gray).—Stems slender, trailing, 1 to several feet long, rooting at the joints, with short erect flowering branches; leaves ½ to 1 inch long, ¾ to 2 inches across, 3- to 5-lobed, the margins irregularly toothed; flower white, about ½ inch across, borne singly on slender erect stems ¾ to 2½ inches long; berries composed of 2 to 5 druplets, red, very finely hairy.

Occurrence.—OLYMPIC: Mount Angeles; Boulder Creek; North Fork Quinault River; Low Divide, 3,600 feet. MOUNT RAINIER, common, 2,000 to 6,000 feet. CRATER LAKE, common: trail to lake shore; near park headquarters.

2. FIVE-LEAVED DWARF BRAMBLE (*Rubus pedatus* Smith).—Similar to *R. lasiococcus* except the leaves divided into 3 to 5 leaflets; berries red, smooth and shining.

Occurrence.—OLYMPIC, common, 1,500 to 3,000 feet: Boulder Creek; Canyon Creek; Duckabush River; Baldy Peak; Elwha River near mouth of Godkin Creek; North Fork Quinault River along trail to Low Divide. MOUNT RAINIER, common, 2,000 to 5,500 feet: Narada Falls. GLACIER, rare: along Lake McDonald-Avalanche trail, 3,500 feet.

3. ARCTIC BRAMBLE (*Rubus arcticus* L.).—Stems slender, more or less erect, up to about 8 inches high; leaves divided into 3 (or 5) leaflets, the leaflets rounded at the tips, somewhat firm, glossy above, coarsely toothed; petals rather large, spreading, rose-pink (rarely white); fruits similar to *R. triflorus.*

Occurrence.—ISLE ROYALE, reported from bogs at Grace Creek.

4. DWARF BRAMBLE (*Rubus triflorus* Rich.),—Plants similar to *R. pedatus, the* stems trailing, or ascending up to about 1 foot high; leaves composed of 3 (or 5) leaflets; leaflets pointed at both ends, the margins coarsely double-toothed, thinnish, smooth; flowers 1 to 3 on slender stems, the petals small, erect, white or sometimes pink; berries composed of few rather large juicy drupelets.

Occurrence.—ISLE ROYALE, common in moist forests: Mott Island; Washington Harbor along trail to Windigo Mine.

5. TRAILING BLACKBERRY (*Rubus macropetalus* Dougl. ex Hook.), fig. 43.—Trailing shrubs with stems 3 to 25 feet long and very prickly with stiff curved prickles, usually unbranched the first year, the nu-

Fig. 43. Trailing blackberry (*Rubus macropetalus*).

merous short flowering branches appearing the second year; leaves usually composed of 3 leaflets (rarely 5), or the upper sometimes merely lobed, the leaf-stalks prickly; leaflets oval, tapering to a point at the tip, the margins toothed, roughish above, somewhat hairy below; ¾ to 2 inches long; flowers white; fruit black when ripe, cylindrical, 1/3 to ¾ inch long.

Trailing blackberry is one of the first species to invade burned areas. However, since strong sunlight is required for best growth and fruit production, the plants are gradually shaded out as the taller conifers and other plants develop. Like most blackberries, this plant is particularly valuable in erosion control work. The long trailing stems soon form a maze of tangled briers and serve effectively to bind the soil.

The leaves are browsed by deer and elk. Birds and small mammals eat the berries, which are usually produced in abundance. They are sweet and delicious and are often gathered by local residents for pies or preserving. Several varieties of cultivated blackberry have been developed from this species.

Occurrence.—OLYMPIC, common at the lower elevations up to about 1,500 feet: Mount Angeles; Elwha River; Skokomish River; Crystal Creek. MOUNT RAINIER, common, up to 2,000 feet: lower southern slope of Shriner Peak in burned area. CRATER LAKE, rare in southwest corner of park: Redblanket Canyon.

6. SNOW DEWBERRY (*Rubus nivalis* Dougl.).—Very similar to trailing blackberry, but with mostly simple leaves, smooth and somewhat shiny, less prickly stems, and red berries.

Occurrence.—OLYMPIC: Lake Crescent; Mount Angeles. MOUNT RAINIER: Nisqually Valley.

7. CUTLEAF BLACKBERRY (*Rubus laciniatus* Willd.).—Shrubs with climbing stems 4 to 15 feet long, armed with stout backwardly-curved thorns; leaves divided into 3 to 5 leaflets, these again deeply divided into rather fine pointed sections, somewhat hairy below; flowers white or pinkish, borne in elongate clusters at the ends of the stems; fruit a blackberry.

This blackberry is a garden plant escaped from cultivation. Although not important in the parks, it is occasionally found growing wild, and where it has become established it may form dense thickets, particularly near streams.

Occurrence.—OLYMPIC, rare, at low elevations. MOUNT RAINIER: rocky soil near Longmire. YOSEMITE: Hazel Green meadows, 6,000 feet. GLACIER: Lake McDonald Hotel.

8. YANKEE BLACKBERRY (*Rubus frondosus* Bigel.).—Shrubs with erect spreading or arching stems, armed with stiff straight or slightly curved prickles; leaflets usually 5 (or 3 on flowering branches), sharply double-toothed, nearly smooth above, velvety below; flowering branches hairy; flowers white, about 1 inch across; fruits black when ripe, smooth, nearly globose, the drupelets rather few.

Occurrence.—ISLE ROYALE, rare: ridge between Lake Benson and Forbes Lake.

The HIMALAYAN BLACKBERRY (*Rubus procerus* Muell.) is found at Indian Gardens in the Grand Canyon where it was cultivated before the area became a national park.

9. SALMONBERRY (*Rubus spectabilis* Pursh).—Shrub with erect stems 3 to 9 feet high; bark reddish-brown, shreddy on old stems, crimson-red in young shoots; stems armed with short, straight, weak prickles or nearly unarmed; leaves mostly composed of 3 leaflets; leaflets 1 to 3½ inches long, egg-shaped with pointed tips, the margins toothed; flowers red, about 1 to 1½ inches across, borne singly or in clusters of 2 or 3; berry ovoid, red or yellow, ½ to ¾ inch long.

Salmonberry is so called because of its large, juicy, typically salmon-colored fruit. These and the showy dark-red flowers may account for the Latin specific name, *spectabilis*. The shrub is usually found along streams or in the moist Douglas fir and Sitka spruce forests of the Northwest. It may sometimes be found in cut-over and burned-over areas, but is seldom abundant except where it borders the virgin forest. Deer and elk browse the foliage during the summer and utilize the twigs during the winter. On the Olympic Peninsula this species has been sought so eagerly by elk that it has been practically eliminated from some of the overgrazed areas. The large, juicy, mild-flavored berries were gathered and prepared in a variety of ways by the Indians. Salmonberry has been cultivated as an ornamental in England since 1827, when it was introduced by David Douglas, an early Scotch botanical explorer in the new world.[20]

Occurrence.—OLYMPIC, common, 1,500 to 3,000 feet: Elwha River near Hayes River; near mouth of Godkin Creek; Canyon Creek. MOUNT RAINIER, common, 2,500 to 5,000 feet: Longmire road; Nisqually Valley; Stevens Canyon trail; Ipsut Creek near Ipsut Pass.

10. WHITEBARK RASPBERRY, BLACKCAP (*Rubus leucodermis* Dougl.), fig. 44.—Shrubs with long cane-like stems armed with short, stiff, curved prickles; leaves divided into 3 to 7 leaflets, these ¾ to 3½ inches long, more or less egg-shaped and often unequal-sided at the base, toothed with coarse, sharp teeth, green above, felty-white below; flowers white, about ½ to 2/3 inch across, borne in few-flowered clusters; berry dark-purple or black when ripe, about ½ inch across, the tiny drupelets packed close together into a compact cup.

The scientific name, leucodermis, comes from the white bark which is very conspicuous on the long, spreading, cane-like stems which often root where they touch the ground. The white under-surface of the leaves also stands out in sharp contrast to the dark green upper surface. The flowers resemble blackberry flowers and the purple-black fruits are similar to black raspberries, hence the name, blackcap. They are sweet and pleasant-flavored and were used by the Indians either fresh, or dried. The young shoots are sweet and edible and were among the favorite foods of the Indians of the Northwest. The plants are browsed to some extent in spite of the sharp thorns thickly covering the stems.

Occurrence.—OLYMPIC, up to about 2,000 feet: Olympic Guard Station; Skokomish River along trail. MOUNT RAINIER, common, 2,000 to 5,000 feet: Carbon River road;

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20 Range Plant Handbook, B 140: United States Department of Agriculture, Forest Service. 1939.

Fig. 44. Whitebark raspberry (*Rubus leucodermis*).

Nisqually Valley. CRATER LAKE, occasional, 4,000 to 6,500 feet: near park headquarters. YOSEMITE, abundant, 3,500 to 6,500 feet: foot of Yosemite Falls; Happy Isles; Mirror Lake; Pohono trail; Hetch Hetchy Valley; Alder Creek. KINGS CANYON: switchbacks on Bubbs Creek trail. SEQUOIA, 5,000 to 7,000 feet: Chagoopa Falls; Wolverton Creek; Cedar Creek; Giant Forest. GLACIER, occasional on the west side: Lake McDonald; Avalanche Camp. ZION, 4,500 feet: trail to upper Emerald Pool; the Grotto; near Hidden Canyon trail.

Var. *leucocarpus* Morton.—Berries white.
Occurrence.—ZION: north base of Angels Landing.

11. WESTERN RED RASPBERRY (*Rubus idaeus* L. var. *aculeatissimus* (Mey.) Regel. & Tiling.), fig. 45.—Shrub with erect or spreading stems 2 to 5 feet long, the stems prickly; leaves divided into 3 to 5 leaflets; leaflets oblong, tapering to a point at apex, the margins irregularly toothed, green

above, paler and often hairy below; flowers white, ½ to ¾ inch across, borne in few-flowered clusters at the ends of the branches; berries red, the small drupelets rather loosely packed on receptacle. (Syn. *R. strigosus* Michx., as to our national parks.)

This shrub very closely resembles the cultivated red raspberry. It is commonly found on wooded slopes or in openings in the forest along with whitebark raspberry with which it is often confused. The stems of western red raspberry are more ascending or nearly erect, while those of the whitebark raspberry are long and cane-like, curving over to touch the ground. The bark of the younger stems is usually reddish and the thorns straight and slender. The berries, composed of fewer and larger drupelets than in whitebark raspberry, are of good flavor. Deer browse the leaves to a certain extent. Young tender shoots were peeled and cooked for food by the Indians of some regions.

Occurrence.—GLACIER, abundant all over park, 3,100 to 6,000 feet: Lake McDonald; Avalanche Campground; St. Mary Lake; Two Medicine Valley; Cut Bank

Fig. 45. Western red raspberry (*Rubus idaeus* var. *aculeatissimus*).

Valley; Swiftcurrent Lake and Valley; trail to Iceberg Lake; trail to Grinnnell Glacier; Kintla Lake. YELLOWSTONE, abundant: Canyon junction; start of trail to lower Yellowstone Falls. GRAND TETON, 6,000 to 8,500 feet: Indian Paintbrush Canyon; Jackson Lake. ROCKY MOUNTAIN: trail to Twin Sisters, 10,000 feet. ISLE ROYALE, common in forest openings and old burns: Mott Island; Lake Richie trail.

Var. *arizonicus* (Greene). GRAND CANYON, on the North Rim: near start of Kaibab trail; Bright Angel Spring.

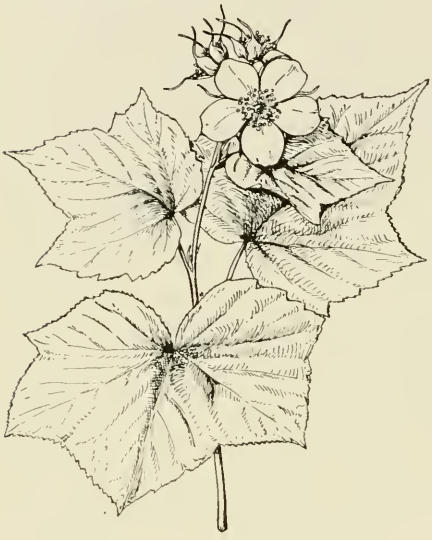

Fig. 46. Western thimbleberry (*Rubus parviflorus*).

12. WESTERN THIMBLEBERRY (*Rubus parviflorus* Nutt.), fig. 46.—Widely spreading shrub 2 to 6 feet high, the young twigs and herbage soft-hairy; bark light brown, shreddy; leaves large, 3 to 12 inches across, usually with 3 to 5 broad lobes, the margins irregularly toothed; flowers white, 1 to 2 (or 3) inches across, borne in clusters of 4 to 7 at the ends of the branches; berries bright red, raspberry-like, about ½ to ¾ inch broad. (Syn. *R. nutkanus* Moc.)

Western thimbleberry is the most abundant and widely distributed of any species of *Rubus* in the western national parks. It is especially abundant along streams in the open woods or on burned-over areas at low or middle elevations, the bushes often growing so close together that the leaves form an almost unbroken mosaic above the forest floor. The large undivided leaves and thornless stems are in contrast to most other raspberries and blackberries which have compound leaves and prickly stems. The species is also sometimes called white flowering raspberry. Large white rose-like flowers are very showy in the spring and early summer, or until replaced by bright scarlet-red raspberry-like fruits. The berries, which are quite tart and strong-flavored, are often eaten by hikers along the trails, but are seldom picked for other uses. They are relished by many kinds of birds and mammals. Deer and elk browse the foliage.

We have not here taken into account the many varieties of this species sometimes recognized in the western states.[21]

Occurrence.—OLYMPIC, abundant: Mount Angeles; Lake Crescent; Elwha River near Camp Wilder; Low Divide; Skokomish Valley; Marmot Lake. MOUNT RAINIER, common, 2,000 to 4,000 feet: Stevens Canyon. CRATER LAKE, common, 4,000 to 5,500 feet: lower Annie Creek; Wildcat Spring; Sun Creek Canyon; Redblanket Canyon. YOSEMITE, occasional, 3,500 to 7,000 feet: Pohono trail; Ledge trail; Happy Isles; Davis road, near Crane Flat. KINGS CANYON: near Sphinx Creek. SEQUOIA, common:

21 Fernald, M. L., Rubus parviflorus and its varieties. Rhodora 37: 273-284. 1935.

Giant Forest. GLACIER, abundant all over the park, in open forests and on open slopes, 3,200 to 6,500 feet: Lake McDonald; Swiftcurrent Lake; trail to Iceberg Lake; trail to Grinnell Glacier; Two Medicine Valley; Cut Bank Valley; St. Mary Lake; Logging Mountain. YELLOWSTONE: near east entrance; below north junction of Mount Washington road; near Rustic Falls; Soda Butte Creek. GRAND TETON, occasional, 6,500 feet: along Wilson road near J. Y. Ranch; mouth of Death Canyon; Cascade Canyon. ISLE ROYALE, widespread and abundant: Mott Island; Washington Harbor.

13. BOULDER RASPBERRY (*Rubus deliciosus* Torr.), fig. 47.—Shrub with stems somewhat reclining or ascending; leaves shallowly 3- to 7-lobed or scarcely lobed, ¾ to 2½ inches across, the lobes blunt-pointed, the margins irregularly toothed, glandular below, the veins hairy; flowers white, 1 to 3 inches across, usually borne singly; fruits purplish, raspberry-like, with few large distinct drupelets, rather dryish.

Occurrence.—ROCKY MOUNTAIN, common: northwest of Estes Cone, 9,100 feet.

13a. NEW MEXICAN RASPBERRY (Var. *neomexicanus* (Gray) Kearney).—Spreading shrub 2 to 4 feet high; similar to boulder raspberry but the leaves usually somewhat larger, more deeply lobed, and at least the middle lobe sharp-pointed, hairy on both sides.

When in flower, this is a very conspicuous shrub along the Kaibab trail below the North Rim of the Grand Canyon.

Fig. 47. Boulder raspberry (*Rubus deliciosus*).

Occurrence.—GRAND CANYON, common in the canyon below the North Rim, 6,000 to 8,000 feet: Kaibab trail.

MOUNTAIN ASH (*Sorbus* L.)

Mountain ash is among the most attractive shrubs in the western national parks. The separate leaflets, the large somewhat flat-topped clusters of white flowers, and the conspicuous red berries easily distinguish the plants as belonging to the mountain ash genus. They are attractive at most any time of the year, and especially in the autumn when the leaves turn a beautiful red color. Birds and squirrels eat the fruits and the foliage is browsed to some extent by the larger animals.

FIELD GUIDE TO THE SPECIES

Leaflets oval to oblong, mostly blunt-pointed at the tips; found in Pacific slope parks.

Leaflets toothed only near the tips; berries covered with a whitish bloom ..... 1. *S. occidentalis.*

Leaflets toothed to near the base; berries without a bloom ..... 2. *S. sitchensis.*

Leaflets oblong-lance-shaped, pointed at the tips; found in Rocky Mountain parks and the Southwest.

Shrubs to 12 feet high; leaflets 11 to 13, 1¼ to 2½ inches long, shiny-green above; found in Rocky Mountain parks ..... 3. *S. scopulina.*

Shrubs to 9 feet high ; leaflets 9 to 11, ¾ to 1½ inches long, dull green above, found in the Southwest ..... 4. *S. dumosa.*

1. WESTERN MOUNTAIN ASH, ALPINE MOUNTAIN ASH (*Sorbus occidentalis* (Wats.) Greene).—Shrubs 3 to 9 feet tall; bark gray; winter buds and young twigs more or less hairy; leaflets 7 to 11, thinnish, dull green above and below, narrowly elliptic to oval, ¾ to 2½ inches long, rounded or flattish at the tip, toothed only at the tip or not at all; flower clusters 1 to 2½ inches across, rounded; berries red, covered with a bloom.

Occurrence.—OLYMPIC, 4,000 to 7,000 feet: Baldy Peak; Seven Lakes Basin; Marmot Lake. MOUNT RAINIER, common, 4,500 to 7,000 feet: Goat Island Mountain; Mazama Ridge; Paradise Park.

2. PACIFIC MOUNTAIN ASH (*Sorbus sitchensis* Roem.), fig. 48.—Many-stemmed shrubs 3 to 12 feet high; winter buds and young twigs thinly hairy; leaflets 9 to 15, oval to oblong, ¾ to 3 inches long, rounded to broadly-pointed at the tips, coarsely and sharply toothed to the middle or below, dull or somewhat shiny green above, paler below; flower-clusters 2 to 5 inches across, somewhat round-topped, the flower stems smooth or thinly hairy; berries red, without a bloom. (Syns. *S. californica* Greene, *S. cascadensis* Jones.)

Occurrence.—OLYMPIC, occasional, 2,000 to 4,000 feet: lower slope of Mount Norton, Elwha River valley; Dosewallips River. MOUNT RAINIER, common, 2,000 to 5,000 feet: Bear Prairie; Frog Heaven. CRATER LAKE: rim road to Lost Creek; Castlecrest Garden, 7,000 feet. LASSEN: Mount Lassen; Long Lake. YOSEMITE, common, 7,000 to 10,000 feet: Ledge trail; Chilnualna Falls; Dog Lake, near Tuolumne Meadows; Gaylor Lakes; Tioga Pass; Isberg Pass trail; Bridal Veil gorge; Snow Creek. KINGS CANYON: between Junction Meadow and Charlotte Creek; Bubbs Creek opposite Charlotte Creek campgrounds. SEQUOIA, occasional, 9,000 to 10,000 feet: Cliff Creek; trail below Tamarack Lake; Emerald Lake; near Alta Peak; Farewell Gap. GLACIER, occasional, 3,000 to 7,000 feet: Lake McDonald; Snyder Lake; Sperry Chalet; Gunsight Lake; Granite Park; Grinnell Lake; trail to Ptarmigan Lake.

Variety *densa* Jepson, with the leaflets more crowded, the flower-clusters denser, and the flowers hairy at the base, has been described from Stubblefield Canyon in Yosemite National Park.

3. GREENE'S MOUNTAIN ASH (*Sorbus scopulina* Greene), fig. 49.—Rather stout shrub 3 to 12 feet high; winter buds more or less sticky, sometimes with a few hairs; leaflets 11 to 13, 1½ to 2¾ inches long, oblong-lance-shaped, pointed at the tip, toothed nearly to the base, dark green and glossy above, paler beneath; flower clusters 3½ to 6 inches across, flat-topped; fruits bright orange-red, without a bloom.

Occurrence.—GLACIER, abundant, 3,000 to 6,000 feet: Belton; Lake McDonald; Cattle Queen snowshoe cabin; Logan Pass; St. Mary Lake; Gunsight Lake; Cut Bank Valley; Two Medicine Lake and valley; Swiftcurrent Lake and valley; Crossley Lake. YELLOWSTONE, common, 6,000 to 8,000 feet: near Old Faithful; west of Thumb;

Fig. 48. Pacific mountain ash (*Sorbus sitchensis*).

Yellowstone Lake and valley below lake; Gibbon River; Firehole River; Mammoth Hot Springs. GRAND TETON: near mouth of Granite Canyon, 6,700 feet. ROCKY MOUNTAIN: Bear Lake; Prospect Canyon; Cub Creek.

4. ARIZONA MOUNTAIN ASH (*Sorbus dumosa* Greene).—Shrub with clustered, slender, erect stems 5 to 9 feet high; bark reddish; winter buds and young twigs densely-hairy; leaflets 9 to 11, small, ¾ to 1½ inches long, narrowly-oblong, pointed at the tips, sharply-toothed almost to base, dark green and somewhat glossy above, pale below; flower clusters 1 to 2½ inches across, round topped; fruits red, glossy.

Occurrence.—GRAND CANYON, on the North Rim; Point Imperial; gully at edge of Walhalla Plateau.

WILD ROSE (*Rosa* L.)

The wild rose is among the most easily recognized of the wild shrubs with the lovely pink or rose-color blossoms and, later in the summer, its conspicuous red fruits popularly called rose hips. Most of the species are more or less thorny or prickly, but some are practically thornless. In a few of the

Fig. 49. Greene's mountain ash (*Sorbus scopulina*).

species even the midribs on the backs of the leaves are often thickly covered with sharp bristles.

Numerous species have been described by different botanists, but the characters are so variable, even on the same plant, that we are here following the conservative recommendations of Erlanson[22] in recognizing comparatively few species as distinct. Other species names are listed as synonyms in their respective places.

The roses, known since earliest times, have featured in many of the old legends and myths. The familiar expression, "bed of roses," originated in Egypt where mattresses of rose leaves were especially prepared for people of high rank. The early European custom of suspending a rose from the ceiling when proceedings were to be kept secret goes back to the legend that cupid bribed the god of silence with a rose.[23] The Indians gathered the fruits for

22 Erlanson, Eileen Whitehead. Experimental data for a revision of the North American wild roses. Bot. Gaz. 96: 197-259. 1934. (See p. 228.)

23 Range Plant Handbook, B 135: United States Department of Agriculture, Forest Service. 1937.

food and the roots were used medicinally. Some of the species are browsed considerably by deer and elk.

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Native or well-established species; sepals not divided (rarely lobed in *R. acicularis*); sepals persistent (except *R. gymnocarpa*).

Leaflets 5 to 7 (of 9); fruits smooth or only slightly hairy, not bristly; shrubs mostly more than 2 feet high.

Flowers mostly solitary (or 2 or 3), on short lateral branches 1 to 4 inches long.

Stems slender; leaflets 1/3 to 1 inch long; flowers mostly less than 2 inches across; fruits mostly less than 1/2 inch thick.

Fruits usually pendent, naked; flowers about 1 inch across ..... 1. *R. gymnocarpa.*

Fruits erect, the sepals remaining at maturity; flowers 1 1/4 to nearly 2 inches across ..... 2. *R. pinetorum.*

Stems stout; leaflets 3/4 to 2 or 2 1/2 inches long; flowers mostly 2 or more inches across; fruits 1/2 inch thick or more.

Prickles short, weak, or the branches unarmed.

Stems mostly unarmed; leaf-rachis softly hairy, not glandular ..... 3. *R. blanda.*

Stems usually more or less bristly, at least the lower; leaf-rachis glandular-hairy ..... 4. *R. acicularis.*

Prickles stout; stems often with finer bristles also.

Stems mostly over 3 feet high; prickles straight, slender; northern species ..... 5. *R. nutkana.*

Stems mostly less than 3 feet high; prickles mostly recurved; southwestern species ..... 6. *R. manca.*

Flowers mostly in clusters of several to many, on long lateral branches more than 4 inches long.

Sepals about 1/8 inch wide, more or less narrowed at base; buds egg-shaped; found on Pacific Slope.

Stems coarse, armed with few to many stout recurved prickles; leaflets hairy on both sides ..... 7. *R. californica.*

Stems slender, armed with weak slender prickles or nearly unarmed ..... 8. *R. pisocarpa.*

Sepals narrower, about 1/16 inch wide, not narrowed at base; buds tapering; found in Rocky Mountains and Southwest ..... 9. *R. Woodsi.*

Leaflets 3 to 5; fruits bristly with stiff hairs; low shrubs not over 2 feet high.

Branches bristly with slender prickles or almost unarmed; flowers about 1 inch across; found in Sierra Nevada parks ..... 10. *R. spithamea.*

Branches armed with long prickles; flowers 1 1/2 to 2 1/2 inches across; found at Grand Canyon ..... 11. *R. stellata.*

Species escaped from cultivation; rare in the parks; sepals usually divided into several lobes, finally falling from fruits.

Flower-stalks and receptacles usually smooth ..... 12. *R. canina.*

Flower-stalks and receptacles glandular-bristly.

Leaflets roundish to oval; found in Olympic National Park ..... 13. *R. Eglanteria.*

Leaflets elliptic to narrowly reverse-egg-shaped; noted from Isle Royale ..... 14. *R. virginiana.*

Fig. 50. Baldhip rose (*Rosa gymnocarpa*).

1. BALDHIP ROSE (*Rosa gymnocarpa* Nutt.), fig. 50.—Erect shrub up to 9 feet high; flowering branches often unarmed, otherwise the stems armed with weak slender straight prickles and finer bristles; leaflets 5 to 9, broadly to narrowly elliptic, 1/4 to 1 inch long, smooth on both sides, usually double-toothed with gland-tipped teeth; flowers rose-pink, about 1 1/4 inches across, usually borne singly, the flower-stalks smooth or glandular-hairy; fruits oblong or pear-shaped, orange-red, naked, the sepals falling together with the disc at top of fruit.

Occurrence. — OLYMPIC, common at lower elevations: Elkhorn Guard Station, Elwha River, 1,374 feet. MOUNT RAINIER, common up to 5,000 feet: Nisqually Valley. CRATER LAKE: southwest corner of park; Annie Creek. YOSEMITE, occasional, up to 5,500 feet: Pohono trail; Tenaya Lake trail; Mariposa Grove. SEQUOIA, occasional in lower parts of park. GLACIER, occasional on west slope at low elevations: Lake McDonald; Belton.

2. PINEYWOODS ROSE (*Rosa pinetorum* Hel.).—Erect shrub 1 to 3 feet high, the stems armed with long straight prickles, often densely so; leaflets 5 to 7, oval to reverse-egg-shaped, 1/3 to 1 inch long, finely glandular-hairy, at least below, glandular-toothed; flowers usually solitary, 1 1/4 to 2 inches across, the flower-stalks smooth or glandular-bristly; fruits usually globose, smooth, about 1/2 inch thick. (Syn. *R. Dudleyi* Rydb.).

Occurrence.—YOSEMITE: Mariposa Grove; Yosemite Valley; Mount Conness; Miguel Meadow. SEQUOIA: Middle Fork Kaweah River, 6,500 feet.

3. MEADOW ROSE (*Rosa blanda* Ait.), fig. 51.—Erect shrub 2 to 6 feet high with slender unarmed stems or with few scattered bristles; leaflets 5 to 7, thinnish, oval or reverse-egg-shaped to oblong-lance-shaped, with rather coarse teeth, 3/4 to 2 1/2 inches long, smooth and dull green

Fig. 51. Meadow rose (*Rosa blanda*).

above, paler and smooth or finely hairy below; flowers large, 2 inches or more across, usually borne singly, the flower-stalks and receptacles smooth; fruits usually nearly globose, about 1/2 inch thick.

Occurrence.—ISLE ROYALE, common: trail to Siskiwit Lake; Grace Island, Washington Harbor.

Fig. 52. Prickly rose (*Rosa acicularis*).

4. PRICKLY ROSE (*Rosa acicularis* Lindl.), fig. 52.—Low shrub up to about 4 feet high, or sometimes up to 6 or 8 feet, the branches armed with fine straight prickles, or practically unarmed; leaflets 3 to 7, broadly elliptic to oblong, 1/2 to 2 inches long, usually pointed at both ends, smooth above, finely hairy and sometimes glandular below; flowers 1 1/2 to 2 1/2 inches across, usually solitary, dark rose-color, fragrant, the flower-stalks usually smooth, rarely slightly glandular-hairy; outer sepals sometimes with 1 or 2 lateral lobes; fruits 1/2 to 3/4 inch thick, pear-shaped to elliptic with a distinct neck, or globose without a neck. (Syns. vars. *Bourgeauiana* Crepin, *rotunda* Erlanson, and *Sayiana* Erlanson, *R. Sayi* Schw.).

Occurrence.—GLACIER, abundant at low elevations, especially on the west side: Belton; Lake McDonald; Apgar Peak; North Fork Flathead River road; Swiftcurrent Lake. YELLOWSTONE: reported from roadside southwest of Nymph Springs. ROCKY

MOUNTAIN: Poudre Canyon. MESA VERDE: road at head of Morfield Canyon. ISLE ROYALE, abundant: Mott Island; Siskiwit Bay; Washington Island.

5. NOOTKA ROSE (*Rosa nutkana* Presl.).—Stout erect shrub 3 to 5 feet high; stems usually dark brown, armed with large straight prickles and the young stems bristly; leaflets 5 to 9, broadly elliptic to narrowly egg-shaped, 1/2 to 2 inches long, dark green and smooth above, finely hairy and often glandular below; flowers large, 2 to 3 inches across, usually solitary, rose-pink, the flower-stalks smooth or slightly glandular-bristly; fruits globose, smooth, without a neck, large and showy when mature, 1/2 to 3/4 inch in diameter. This is one of the most showy of the rose species both in flower and fruit. (Syn. *R. Spaldingi* Crepin.)

Occurrence.—OLYMPIC, abundant, 1,500 to 4,000 feet: Duckabush River; Hoh River; Beaver Creek; Hurricane Ridge; Elwha River; Low Divide; North Fork Quinault River. MOUNT RAINIER, common, 2,500 to 4,500 feet: Mount Wow; near Ricksecker Point; Goat Mountain; Tipsoo Lake.

6. MANCOS ROSE (*Rosa manca* Greene).—Shrub up to 6 or 8 feet high, the stems armed with curved prickles; leaflets 5 to 7, oval to egg-shaped, 3/4 to 1 3/4 inches long, smooth on both sides or finely hairy below; flowers solitary or several, 1 to 1 1/2 inches across; fruits globose. (Syns. *R. oreophila* Greene, *R. melina* Greene.)

Occurrence.—MESA VERDE. BRYCE CANYON: west of canyon road, 8,000 feet. ZION: near northern boundary of park, 5,900 feet. GRAND CANYON, on the North Rim.

7. CALIFORNIA ROSE (*Rosa californica* C. & S.).—Stout shrub up to 9 feet high; prickles stout, curved, about 1/4 inch long, flattened at the broad base, often paired below the leaves, the stems sometimes with bristles also; leaflets 5 to 7, broad-elliptic to narrowly reverse-egg-shaped, about 3/8 to 1 1/4 inches long, usually simple-toothed, hairy on both sides, not glandular; flowers few to many in leafy-bracted clusters or sometimes solitary, pink, about 1 1/2 inches across, the sepals hairy outside; flower-stalks smooth or slightly hairy; fruits globose, with a distinct neck, about 1/2 inch across. The bushes often form thickets along streams or on moist flats where they furnish good browse for animals.

Occurrence.—YOSEMITE, in meadows up to 6,500 feet: Hetch Hetchy. SEQUOIA: head of Bennett Creek, 5,900 feet; Dorst Creek.

8. PEAFRUIT ROSE (*Rosa pisocarpa* Gray).—Slender shrub 2 to 6 feet high, often forming dense thickets; prickles weak, slender, sometimes nearly 1/4 inch long, or the branches sometimes nearly or entirely unarmed; leaflets 5 to 7, elliptic-oblong to narrowly reverse-egg-shaped, 1/3 to 1 3/4 inches long, coarsely toothed, smooth or finely hairy below; flowers pink, about 1 to 1 3/4 inches across, borne in several-flowered clusters or sometimes solitary; fruits globose, about 1/3 inch across, sometimes with a short neck. (Syns. *R. Pringlei* Rydb., *R. rainierensis* Jones, *R. ultramontana* Hel.).

Occurrence.—OLYMPIC, at lower elevations. MOUNT RAINIER: Nisqually Valley;

Mount Wow. LASSEN. KINGS CANYON: between Junction and Vidette Meadows. SEQUOIA.

9. WOODS ROSE (*Rosa Woodsi* Lindl.), fig. 53.—Mostly low shrubs 1 to 3 feet high, but sometimes up to 6 feet high; stems armed with straight or somewhat curved slender prickles, or the prickles few; leaflets 5 to 7, ½ to 1¼ inches long, mostly simple-toothed, sometimes double-toothed, smooth or finely glandular-hairy, the teeth often gland-tipped; flowers about 1 inch across or slightly larger, usually 2 to several in a cluster; fruits globose to ellipsoid, about 1/3 to ½ inch thick; occurs in fields, along streams, or in open woods and is an important browse species for animals. (Syns. *R. Fendleri* Crepin, *R. arizonica* Rydb., *R. pyrifera* Rydb., *R. neomexicana* Cock., *R. granulifera* Rydb.).

Fig. 53. Woods rose (*Rosa Woodsi*).

Occurrence.—GLACIER: Belton; Lake McDonald; Swiftcurrent Lake; east entrance. YELLOWSTONE: Tower Falls ranger station; east entrance; Stevenson's Island. GRAND TETON: near southwestern boundary of park, 6,500 feet. ROCKY MOUNTAIN. MESA VERDE: east-facing slopes along Prater Canyon trail. BRYCE CANYON. ZION: Blue Springs; Potato Hollow, 6,775 feet. GRAND CANYON. North Rim, 7,500 to 8,500 feet: Cape Royal. South Rim: east of Grand View. Canyon, rare.

10. GROUND ROSE (*Rosa spithamea* Wats.).—Low shrub 1 to 2 feet high, the stems from creeping rootstocks; prickles straight, slender, or the stems almost unarmed; leaflets usually 5, oval to roundish, ½ to 1½ inches long, glandular-toothed, smooth or slightly hairy above, glandular-hairy below; flowers several in a cluster or sometimes solitary, about 1 inch across; fruits small, ellipsoid or nearly globose, about 1/3 inch thick, more or less bristly with gland-tipped bristles.

Occurrence.—YOSEMITE: southeast of Crane Flat; Mariposa Grove; north of Eleanor Lake. SEQUOIA: southwest of Colony Mill ranger station, 5,000 feet.

11. DESERT ROSE (*Rosa stellata* Woot.).—Low shrub up to 2 feet high; stems armed with numerous slender straight or slightly curved prickles and covered with fine branched hairs when young; leaflets 3 or sometimes 5, broadly wedge-shaped, ¼ to ½ inch long, sharply and irregularly toothed, usually hairy on both sides; flowers solitary, deep rose-purple, 1½ to 2½

inches across; fruits broadly top-shaped, about 1/2 inch thick, dull reddish, covered with stiff bristles. (Syn. *R. mirifica* Greene.)

Occurrence.—GRAND CANYON: Mesa Eremita, 6,500 feet; Powell's Plateau.

12. DOG ROSE (*Rosa canina* L.).—Spreading shrub up to 9 feet high, the branches often arching; stems armed with stout prickles; leaflets 5 to 7, oval to elliptic, 3/4 to 1 1/2 inches long, smooth on both sides or slightly hairy below; flowers 1 to 3, light pink or white, 1 1/2 to 2 inches across, the flower-stalks usually smooth; sepals usually divided into several lobes, becoming reflexed and finally falling from fruits; fruits scarlet, ellipsoid, about 1/2 to 1 3/4 inches long, usually smooth.

Occurrence.—OLYMPIC: Solduc Hot Springs.

13. SWEETBRIER ROSE (*Rosa Eglanteria* L.).—Much-branched shrub with aromatic herbage; prickles strong, flat, hooked, mostly just below the leaves; leaflets 5 to 7, roundish to oval, 1/2 to 1 1/4 inches long, smooth and dark green above, hairy below, glandular on both sides; flowers 1 to 3, bright pink, 1 1/4 to 2 inches across, the flower-stalks glandular-bristly; sepals divided into several lobes, spreading and later falling from fruits; fruits orange-red, globose to egg-shaped, about 1/2 to 3/4 inch long, usually more or less glandular-bristly. (Syn. *R. rubiginosa* L.)

Occurrence.—OLYMPIC: Skokomish River.

14. VIRGINIA ROSE (*Rosa virginiana* Mill.).—Erect shrub with stout more or less hooked prickles; leaflets 7 to 9, elliptic to narrowly reverse-egg-shaped, 3/4 to 1 1/2 inches long, dark green and lustrous above, smooth on both sides except sometimes on veins below; flowers solitary or few, 2 to 2 1/2 inches across, the flower-stalks and receptacles glandular-bristly; outer sepals sometimes with 1 or 2 small lobes; fruits about 1/2 inch thick, more or less glandular-bristly.

Occurrence.—ISLE ROYALE: A form of this species has apparently escaped cultivation and persisted at McCargo Cove along trail to Minong Mine.

HAWTHORN (*Crataegus* L.)

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Leaves deeply cut; thorns about 1/4 to 1 inch long; berries black; occurs in Pacific coast and Rocky Mountain parks ..... 1. *C. Douglasi.*

Leaves less deeply cut; thorns 1 to 2 inches long; berries red; occurs in Rocky Mountain National Park ..... 2. *C. chrysocarpa.*

1. DOUGLAS HAWTHORN (*Crataegus Douglasi* Lindl.), fig. 54.—Stout shrub or small, round-topped tree, 5 to 24 feet high, with shiny red twigs; leaves oblong to more or less egg-shaped, 1 to 2 (or 4) inches long, irregularly double-toothed, dark green above, paler below; flowers white, ill-smelling, borne in flattish clusters at the ends of the branches; petals about 1/4 to 1/3 inch long; fruits black or purplish-black, apple-like, 1/3 to 1/2 inch long.

Black hawthorn is the common hawthorn of the northwestern United

States. It ranges from California to British Columbia and east to the Rocky Mountains, occurring along the borders of mountain streams and in moist, gravelly or sandy soils. It is usually a shrub, but in favorable locations it may also become a tree. The bushes are easily distinguished by the stout, sharp thorns, often nearly 1 inch long, and by the more or less flat-topped clusters of small ill-smelling, white flowers. The small apple-like fruits or "haws" were dried for winter use by the Indians of some regions. The foliage is browsed by deer.

Occurrence.—OLYMPIC: Enchanted Valley near the falls, 2,000 feet. GLACIER, common at low elevations, 3,200 to 4,000 feet: Belton; Lake McDonald; highway above Avalanche Camp; Camas Creek; lower end of St. Mary Lake. GRAND TETON: eastern boundary, near Moose, 6,600 feet.

Fig. 54. Douglas hawthorn (*Crataegus Douglasi*).

2. FIREBERRY HAWTHORN (*Crataegus chrysocarpa* Ashe.).—This is a shrub or dwarf tree found in the Rocky Mountains of Colorado. It occurs on rocky hills in Rocky Mountain National Park but is not very frequent. The species differs from Douglas hawthorn in having longer spines (1 to 2 inches long) and dark red fruits.

Occurrence.—ROCKY MOUNTAIN, occasional: west of Moraine Park.

SERVICEBERRY (*Amelanchier* Medic.)

The serviceberries are widely distributed in the United States, one or more species occurring in each of the western national parks. The shrubs are known by the English name, serviceberry, because of the similarity of the fruits to the European servicetree (*Sorbus domesticus*), but there are many other names in popular use. The common name, juneberry, is used in many places because the berries ripen in June while on the Atlantic coast the name, shadbush, is popular because the flowers bloom when the shad are running. Other common names are saskatoon, sarvisberry, and pigeonberry.

The foliage of the serviceberry is considered an excellent browse for deer, elk, and moose, and the fruits are eaten by bears, small mammals, and birds. Indians used the wood for arrow shafts and the fruits were among their most important winter foods. They were collected, dried, and stored, or used fresh in soups and stews.

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Leaves 1 to 1½ inches long; shrubs or small trees with erect or loosely spreading stems.
Leaves rather coarsely toothed, mostly above the middle, more or less rounded or squared at tips.
Leaves smooth, at least above, at maturity; flowers with petals ½ inch or more long, or only slightly less; fruits dark purple at maturity.
Erect shrub or small tree; leaves soon smooth on both sides; flowers with petals ½ to nearly 1 inch long, borne in oblong clusters; northwestern species ..... 1. *A. florida.*
Usually low and shrubby; leaves hairy or woolly below; flowers with petals about ½ inch long or slightly less, borne in short dense clusters; widespread and variable species ..... 2. *A. alnifolia.*
Leaves hairy on both sides; flowers with petals about ¼ inch long; fruits pale orange or yellowish at maturity ..... 3. *A. utahensis.*
Leaves closely and finely toothed, usually to near the base, mostly pointed at tips.
Flowers several to many in a cluster; young leaves remaining folded for some time after opening of bud ..... 4. *A. canadensis.*
Flowers 1 to 3; leaves flat when unfolding from the bud .... 5. *A. Bartramiana.*
Leaves mostly less than ¾ inch long; compact shrubs or many-stemmed trees with dense rounded crowns ..... 6. *A. Covillei.*

1. PACIFIC SERVICEBERRY (*Amelanchier florida* Lindl.), fig. 55.—Tall erect shrubs 4 to 10 feet high or slender and tree-like, sometimes reaching 20 feet high; bark smooth, grayish or reddish; leaves elliptic to nearly round, ¾ to 2 inches long, rounded at base, usually toothed at least above the middle, green and smooth on both sides or thinly hairy below when young; flowers white, borne in showy oblong clusters of few to many; petals 5, narrowly oblong, ½ to nearly 1 inch long; fruits juicy apple-like berries, about ⅜ inch in diameter, dark purple when ripe. (Syn. *A. elliptica* Nels.).

Fig. 55. Pacific serviceberry (*Amelanchier florida*).

Occurrence.—OLYMPIC: Lake Crescent; Duckabush River. MOUNT RAINIER: Lodi Creek below Berkeley Park, 5,500 feet; Nisqually Valley. CRATER LAKE, occasional: Garfield Peak trail; near southern boundary of park. GLACIER, common on the west side, 3,100 to 4,000 feet: Belton; Lake McDonald; Avalanche campground.

2. SASKATOON SERVICEBERRY (*Amelanchier alnifolia* Nutt.), fig. 56.—Erect shrub 2 to 6 feet high; bark reddish-brown or the older grayish; branchlets hairy; leaves elliptic to roundish, ¾ to 1½ inches long, dark green and becoming smooth above at maturity, hairy or woolly below, usually becoming almost smooth in age; flower clusters rather short and dense, the flowers white, the petals about ½ inch long or slightly less; flower-stems and calyces usually more or less hairy or silky; berries ¼ to ⅜ inch in diameter, dark purple at maturity. (Syns. *A. Goldmani* Woot. & Standl., *A. spicata* (Lam.) Koch., *A. pallida* Greene).

Occurrence.—LASSEN. YOSEMITE, common, 4,000 to 7,500 feet: Yosemite Valley; Ledge trail; Tenaya Lake trail; southwest of Mount Starr King; Isberg Lake trail. KINGS CANYON: between Junction and Vidette Meadows. SEQUOIA. GLACIER, abundant. 3,100 to 6,000 feet: St. Mary Lake; Otokomi Lake trail; Swiftcurrent Lake; trail to

Fig. 56. Saskatoon serviceberry (*Amelanchier alnifolia*).

Fig. 57. Hairyleaf serviceberry (*Amelanchier utahensis*).

Iceberg Lake; Crossley Lake; Two Medicine Lake; Cutbank Valley; Belton. GRAND TETON, occasional, 6,500 to 7,100 feet: Death Canyon; Granite Canyon; near eastern park boundary. YELLOWSTONE, abundant: east entrance; West Thumb; west of Lake Junction; near Mud Geyser; near west entrance. ROCKY MOUNTAIN, occasional on hillsides and along streams, below 9,000 feet. ZION, 5,500 to 7,000 feet: Potato Hollow south of Horse Pasture Plateau; highway near western boundary of park. GRAND CANYON, on the North Rim and just below, 7,500 to 8,500 feet: near Neal Spring; Cape Royal; Kaibab trail. ISLE ROYALE, common: Mott Island; near old Rock Harbor lighthouse.

3. HAIRYLEAF SERVICEBERRY (*Amelanchier utahensis* Koehne), fig. 57.—Spreading shrub or small tree with stout rigid branches; leaf-blades elliptic to oval or roundish, rounded to more or less heart-shaped at base, ¾ to 1 inch long, coarsely toothed above the middle, rounded or squared at tips, pale green, hairy on both sides; flowers small, white, the petals slightly more than ¼ inch long, borne in short clusters; fruits about ¼ inch in diameter, pale orange or yellowish in maturity, finely hairy. (Syn. *A. Bakeri* Greene.)

Occurrence.—MESA VERDE. GRAND CANYON, 6,800 to 8,000 feet. South Rim at edge of rim: near El Tovar; near top of Bright Angel trail. Canyon: just below North Rim on Kaibab trail.

Fig. 58. Shadblow serviceberry (*Amelanchier canadensis*).

Fig. 59. Thicket serviceberry (*Amelanchier canadensis* var. *oblongifolia*).

4. SHADBLOW SERVICEBERRY (*Amelanchier canadensis* (L). Medic.), fig. 58.—Tall shrubs or small trees up to 30 feet high, the herbage at first white-woolly, soon becoming smooth; leaves egg-shaped to oblong-egg-shaped, usually more or less heart shaped at base, pointed at tips, finely toothed, 1½ to 3 inches long when mature, young leaves folded as buds unfold; flowers white, the petals ½ to 1 inch long, borne in showy drooping clusters; fruits globose, dark purplish or purplish-red, the fruiting stalks elongated.

Occurrence. — ISLE ROYALE: Washington Harbor along trail to Windigo Mine.

4a. THICKET SERVICEBERRY (Var. *oblongifolia* T. & G.), fig. 59.—Similar to the species but usually smaller throughout; young leaves and flower clusters densely white-woolly; leaves 1½ to 2½ inches long; flowers with petals seldom over ½ inch long; fruiting stalks shorter than in the species.

Occurrence.—ISLE ROYALE, common: Mott Island; Sumner Lake.

Fig. 60. Apple-flowered serviceberry (*Amelanchier Bartramiana*).

5. APPLE-FLOWERED SERVICEBERRY (*Amelanchier Bartramiana* (Tausch.) Roem.), fig. 60.—Erect shrub 3 to 9 feet high, the herbage soon smooth; leaves thinnish, oblong to oval, 1 to 2 inches long, usually more or less pointed at both ends; flowers 1 to 3 (or 4), the petals narrowly reverse-egg-shaped, ½ to ¾ inch long; fruits broadly pear-shaped to nearly globose, dark purple with a whitish bloom. (Syn. *A. oligocarpa* (Michx.) Roem.)

Occurrence.—ISLE ROYALE, common in the forests: Mott Island; near old Rock Harbor lighthouse.

6. DESERT SERVICEBERRY (*Amelanchier Covillei* Standl.), fig. 61.—Bushy shrub 4 to 10 feet high or often tree-like with a dense rounded crown close to the ground; leaves oblong or elliptic to oval, 1/3 to ¾ inch long, blunt or sometimes pointed at tips; smooth above, smooth or finely hairy or fuzzy below, the margins rather finely toothed to near base or sometimes not toothed; flowers small, the petals about ¼ inch long, borne in dense rather few-flowered clusters; fruits globose, small.

Occurrence.—MESA VERDE: highway at north end of Mesa, 7,900 feet. BRYCE CANYON: edge of rim near park headquarters. ZION, common, 4,500 feet: south side of canyon near south entrance; highway east of tunnel; near Zion Lodge. GRAND CANYON, 4,000 to 8,200 feet. North Rim, occasional at edge of rim; Cape Royal; McKinnon Point. South Rim, abundant: in front of El Tovar; Rim drives; Yavapai Point; Grandview Point; Shoshone Point. Canyon, common along trails below South Rim: Cedar Ridge near fossil fern quarry; Kaibab trail; Bright Angel trail; Hermit trail.

SQUAW-APPLE (*Peraphyllum ramosissimum* Nutt.).—Low, intricately branched shrub 2 to 6 feet high; bark grayish; leaves ½ to 2½ inches long, narrowly oblong, tapering to the base, more or less pointed at the tip, the margins very finely toothed or not toothed, borne mostly in clusters of several at the ends of short peg-like branchlets; flowers solitary on slender stems or in clusters of 2 or 3, pale rose color, ½ to ¾ inch across, the petals 5; fruits small apples 1/3 to ½ inch in diameter, yellowish, often with a rosy cheek.

The foliage of this shrub is browsed to a certain extent, especially in the

Fig. 61. Desert serviceberry (*Amelanchier Covillei*).

Spring and Fall. The small apple-like fruits were utilized by the Indians, hence the common name, squaw-apple.

Occurrence.—MESA VERDE, 7,000 to 8,000 feet: northwest of park headquarters; east edge of Chapin Mesa near Far View House; north end of park. ZION: trail between East Rim ranger cabin and Observation Point.

CHERRY, CHOKECHERRY, PEACH, PLUM (*Prunus* L.)

FIELD GUIDE TO THE SPECIES

Leaves oblong to lance-shaped or egg-shaped, 1 to 4 inches long; branchlets without spine-tips.

Flowers borne in dense cylindrical clusters 2 to 6 inches long; fruits dark red to black; leaf-blades 2 to 4 inches long, thickish. (Chokecherries)

Fruits red to purple; leaf-stalks with 1 or 2 glands below the blades; leaf-blades with tufts of hairs in axils of veins below.

Occurs in eastern United States ..... 1. *P. virginiana.*

Occurs on Pacific slope ..... 1a. Var. *demissa.*

Fruits black; leaf-stalks glandless, the blades smooth below; occurs in Rocky Mountains and Southwest ..... 1b. Var. *melanocarpa.*

Flowers borne in loose more or less flat-topped clusters; fruits bright red; leaf-blades ¾ to 2½ inches long. (True cherries)

Leaf-blades oblong; flowers small, 1/3 to nearly ½ inch across; fruits 1/3 to ½ inch long.

Leaves mostly blunt or rounded at tips; occurs on Pacific slope ..... 2. *P. emarginata.*

Leaves mostly pointed at tips; occurs in Rocky Mountains ..... 3. *P. pennsylvanica* var. *saximontana.*

Leaf-blades egg-shaped to elliptic or roundish; flowers ½ to ¾ inch across; fruits ¾ to 1 inch long; occurs in Sierra Nevada parks ..... 4. *P. subcordata.*

Leaves linear to spatula-shaped, ⅜ to ½ inch long; branchlets rigid and often spine-tipped; occurs in the Grand Canyon ..... 5. *P. fasciculata.*

1. COMMON CHOKECHERRY (*Prunus virginiana* L.) and varieties.—Erect shrubs or small trees 2 to 15 feet high; leaf-blades 2 to 4 inches long, oblong-egg-shaped to elliptic, pointed at the tips, rather thickish, finely toothed along the margins, smooth and shiny above, smooth or somewhat hairy at the juncture of the veins below; flowers white, ¼ to ½ inch across, borne in elongated, cylindrical clusters 3 to 4 (or 6) inches long; fruits cherry-like, about ¼ to ½ inch in diameter, red to purple or black when mature, sweet but more or less astringent.

The chokecherries are very attractive shrubs or small trees, conspicuous in the Spring with their showy white flowers in elongate clusters sometimes 6 inches long. The fruits, small juicy cherries, though rather astringent when eaten fresh, are often collected for making jelly, and they are relished by birds and small mammals. The Indians used them fresh, or they dried and pounded them into a meal which was mixed with dried meat to make pemmican.

Foliage of young shoots is often poisonous to animals, but experiment shows that if eaten moderately and in combination with other feed, it is without ill effect. Apparently it is not poisonous to deer and elk in the Fall. The poisonous principle, hydrocyanic (prussic) acid, is not present in the foliage itself but develops after the leaves have been crushed and moistened, as occurs prior to digestion.[24]

Two varieties of chokecherry recognized in the western United States are distinguished from the species by rather minute characteristics, as seen below.

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24 Range Plant Handbook B 114: United States Department of Agriculture, Forest Service. 1937.

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Fruits red to purple; leaf-blades with tufts of hairs in axils of the veins below, the stalks with 1 or 2 glands below the blades.

Occurs in eastern United States ..... 1. *P. virginiana.*

Occurs on Pacific slope ..... 1a. Var. *demissa.*

Fruits black; leaf-blades smooth below, the stalks glandless; occurs in Rocky Mountains and Southwest ..... 1b. Var. *melanocarpa.*

Occurrence.—1. COMMON CHOKECHERRY (*P. virginiana* L.). ISLE ROYALE, common: Mount Franklin trail; Mount Ojibway trail; Lake Richie trail; Washington Harbor.

1a. WESTERN CHOKECHERRY (Var. *demissa* (Nutt.) Torr.). LASSEN. YOSEMITE, rare, about 4,000 feet: near foot of Yosemite Falls; Wawona. SEQUOIA, about 3,500 feet: west of Panoroma Peak; east of Hospital Rock.

1b. BLACK CHOKECHERRY (Var. *melanocarpa* (Nels.) Sarg.), fig. 62. GLACIER, common, 3,800 to 6,000 feet: Belton; Avalanche campgrounds; Logging Mountain; trail to Sperry chalet; Swiftcurrent Lake; trail to Iceberg Lake; trail to Triple Divide. YELLOWSTONE, abundant: lower Yellowstone River; Lost Creek; Melvin Gulch; Mammoth Hot Springs. GRAND TETON, occasional, 6,600 feet: along road near park headquarters; moraine east of Phelps Lake. ROCKY MOUNTAIN, common. MESA VERDE: head of Navajo Canyon. BRYCE CANYON: rim road between Bryce Point and Farview. ZION, on the plateaus: West Rim trail near ranger cabin, about 6,000 feet. GRAND CANYON, North Rim, rare: vicinity of Neal Spring, 8,300 feet.

Fig. 62. Black chokeberry (*Prunus virginiana* var. *melanocarpa*).

2. BITTER CHERRY (*Prunus emarginata* (Dougl.) Walp.), fig. 63.—Shrub 3 to 8 feet high, or slender tree up to 20 or 30 feet high; bark smooth, thin, gray to dull red-brown; leaf-blades smooth, ¾ to 2½ inches long, oblong with a blunt-pointed or rounded tip, or more or less tapering to the base, the margins finely toothed, borne on short stalks; flowers white, 1/3 to ½ inch across, 3 to 10 in spreading, more or less flat-topped clusters borne in the leaf-axils; fruits cherry-like, bright red, 1/3 to nearly ½ inch long, very sour and bitter.

Bitter cherry is very variable in form, depending upon the conditions in which it grows. In high, rocky or exposed locations it is a much-branched shrub 3 to 8 feet high with smooth, gray bark, while in the lower, moist situations it becomes a slender tree as high as 20 to 30 feet. The shrub is characteristic of open brush types where it sometimes forms dense thickets. A form with finely hairy leaves found in Olympic and Mount Rainier National Park has been designated as

variety *mollis* (Dougl.) Brew. The foliage furnishes good browse for deer and elk, especially towards the end of the season. The bright, coral-red berries are juicy and luscious-looking, but are very sour and bitter to the taste. They are not poisonous, however, and birds and small mammals relish them for food.

Occurrence.—OLYMPIC, 580 to 3,000 feet: Lake Crescent; Elwha Valley; southwest of Windfall Peak; Hurricane Ridge; Skokomish River; Duckabush River. MOUNT RAINIER, 3,500 to 6,500 feet: Mount Wow; above Fallen Rock. CRATER LAKE, 5,350 to 6,250 feet: along Klamath road near south entrance. LASSEN, occasional: near Lava Tube. YOSEMITE, abundant, 4,000 to 7,000 feet: Yosemite Valley; 1 mile above Chinquapin, on Glacier Point road; Glacier Point; Ledge trail; Merced Lake trail; Lyell Fork, Tuolumne River; Tuolumne Grove of bigtrees; Alder Creek; Wawona. KINGS CANYON: Ouzel Basin; between East Lake and Junction Meadows. SEQUOIA, abundant and widely distributed, 6,000 to 10,000 feet: Lodgepole Camp; Alta Peak; Redwood Meadow ranger station; Big Arroyo. GLACIER, occasional on the west side of the park where it often becomes tree-like, 3,100 to 5,500 feet: Belton, along road near old Flathead River bridge; trail to Sperry Chalet.

3. MANITOBA PIN CHERRY, ROCKY MOUNTAIN RED CHERRY (*Prunus pennsylvanica* L. var. *saximontana* Rehd.).—Shrub 3 to 6 feet high; bark light red-brown; leaves oblong, 1 to 3 inches long, tapering to a point at the tip, the margins finely toothed, smooth on both sides; flowers small, white or greenish-white, 3 to 7 on slender stems, forming loose umbel-like clusters in the leaf-axils; fruit small, cherry-like, about 1/3 inch in diameter, light red, or yellow with red cheeks, very sour and bitter. (Syn. *P. corymbulosa* Rydb.).

Occurrence.—GLACIER, common on the east side, 4,500 to 6,000 feet: Many Glacier; Atlantic Creek valley along trail to Triple Divide Pass; Otokomi Lake trail. ROCKY MOUNTAIN, occasional: creek east of park headquarters, 4,100 feet. MESA VERDE.

Fig. 63. Bitter cherry (*Prunus emarginata*).

4. KLAMATH PLUM (*Prunus subcordata* Benth.).—Shrub 4 to 8 feet high or sometimes tree-like; branches usually crooked and some spine-tipped; leaf-blades egg-shaped to elliptic or roundish, 3/4 to 2 inches long, finely toothed; flowers white, becoming rose in age, about 1/2 to 3/4 inch across, borne on short stems in clusters of 2 to 4 in the leaf axils; fruit red, ellipsoid, 3/4 to 1 1/4 inches long.

The fruits of Sierra plum are much larger than those of the wild cherries

and chokecherries and in some areas have been highly valued as food. They are first put into boiling water to take away the bitterness in the skin and are then used for making jellies or preserves. The shrubs seldom set good fruit in the parks, however, but develop bladdery structures caused by a fungus.[25]

Occurrence.—YOSEMITE, rare, at the lower elevations: Hetch Hetchy; near Ackerson Meadow, north of Carl Inn, 4,700 feet; lower Yosemite Valley. SEQUOIA, rare: Clough Cave.

Fig. 64. Desert peachbrush (*Prunus fasciculata*).

5. DESERT PEACHBRUSH (*Prunus fasciculata* (Torr.) Gray.), fig. 64.—Intricately branched shrub 2 to 6 feet high with stiff, often spine-tipped branches; leaves linear-oblong to spatula-shaped, 1/4 to 3/4 inch long, finely hairy or smooth, the margins not toothed or some with a few shallow teeth, bunched along the stems on short peg-like branchlets; flowers 1 to several in the leaf-axils, small and inconspicuous, the purplish-green calyx deeply cup-shaped, about 1/8 inch long; petals 5, tiny, white, soon falling; fruits small, about 3/8 inch long, ovoid, densely hairy, resembling miniature peaches with thin flesh, hence the common name. (Syn. *Emplectocladus fasciculatus* Torr.)

Occurrence.—GRAND CANYON, common in the canyon, 3,000 to 4,000 feet: Kaibab trail, on the Tonto south of the Colorado River and up Bright Angel Creek about 2 miles above Phantom Ranch; Bright Angel trail along switchbacks above Pipe Creek; Hermit trail.

OSO BERRY (*Osmaronia cerasiformis* (T. & G.) Greene).—Erect shrub 3 to 12 feet high; bark smooth; leaf-blades oblong, tapering at both ends, pointed or rounded at the tip, 1 1/2 to 4 inches long, light green above, paler below, the margins not toothed or very inconspicuously toothed; flower clusters oblong, several-flowered, drooping; flowers white, the petals 1/6 to 1/4 inch long, the male and female flowers borne on separate plants; fruits 1 to 5 to a flower, plum-like, about 1/3 to 1/2 inch long, black when ripe, the pulp thin and bitter.

Occurrence.—MOUNT RAINIER, rare: Nisqually Valley at lower elevations. SEQUOIA, rare, at lower elevations: Old Colony Mill, Marble Fork Kaweah River.

NINEBARK (*Physocarpus* Maxim.)

Ninebark has received its common name from its characteristic shreddy bark which is made up of many layers and peels from the old stems in shreds. Several species are recognized, all of which are very similar in general appearance. The shrubs are very attractive in flower with their dense rounded or flat-topped clusters of white flowers. The fruits are one- to few-seeded

25 Jepson, W. L., Flora of California, vol. 2, p. 28. 1936.

pods which often turn reddish at maturity as do also the leaves in the Fall. The plants are found in various locations, in open woods, along streams, or on open rocky slopes or ridges. The foliage is browsed to a certain extent by deer and elk. (Syn. *Opulaster* Medic.)

FIELD GUIDE TO THE SPECIES

Shrubs found in Rocky Mountain parks; pods 2 (rarely 3), abruptly short-pointed, scarcely more than 1/8 inch long, more or less flattened and with conspicuous ridge down the back, united from base to middle or above, more or less white woolly.

Shrubs usually less than 3 feet high; leaf-blades mostly less than 1 inch long, 1/3 to 1 1/4 inches long; leaf-stalks 1/2 inch or less long ..... 1. *P. monogynus.*

Shrubs 3 to 6 feet high; leaf-blades mostly more than 1 inch long; leaf-stalks 1/3 to 1 1/4 inches long.

Bracts at base of flower-stems all membranous and scale-like, soon falling ..... 2. *P. malvaceus.*

Bracts at base of lower flower-stems often leaf-like and persistent ..... 3. *P. bracteatus.*

Shrubs found in Pacific Slope parks or on Isle Royale; pods 3 to 5, 1/4 to 3/8 inch long, with long tapering tips, more or less inflated, united only at base or slightly above, not hairy when mature.

Leaves usually finely woolly below; flower-stalks and calyces densely woolly; occurs on Pacific slope ..... 4. *P. capitatus.*

Leaves smooth below or nearly so; flower-stalks and calyces smooth or only sparingly hairy; found on Isle Royale ..... 5. *P. opulifolius.*

1. MOUNTAIN NINEBARK (*Physocarpus monogynus* (Torr.) Coult.).—Shrubs usually less than 3 feet high; often with main stem lying along the ground; bark brownish; leaf-blades 1/3 to 1 1/4 inches long, broadly egg-shaped to kidney-shaped, the leaf-stalks 1/2 inch long or less; pods usually 2, usually united to above the middle, 1/8 inch long, densely white-hairy.

Occurrence.—ROCKY MOUNTAIN, 9,000 feet and above; trail to the Loch; trail to Lake Mills.

2. MALLOW NINEBARK (*Physocarpus malvaceus* Kuntze).—Leaf-blades 1 to 2 1/2 inches long, roundish to broadly egg-shaped, green above, paler below; leaf-stalks 1/3 to 3/4 inch long; bracts at base of flower stems all membranous and scale-like, soon falling.

Occurrence.—GLACIER, rare: Belton, around park headquarters. YELLOWSTONE. GRAND TETON.

3. TWINPOD NINEBARK (*Physocarpus bracteatus* (Rydb.) Rehd.).—Differs from mallow ninebark in having some of lower bracts at base of flower stems often leaf-like and persistent.

Occurrence.—ROCKY MOUNTAIN: northeast of Moraine Park, 8,300 feet.

4. PACIFIC NINEBARK (*Physocarpus capitatus* (Pursh) Kuntze), fig. 65.—Erect or straggly shrub 3 to 5 feet high, sometimes producing prostrate branches 15 or 20 feet long; old bark loose and shaggy; leaf-blades broadly

egg-shaped, 3- to 5-lobed, 1 to 3 inches long, or those of the sterile shoots up to 4 inches long, usually softly fuzzy below with branched hairs; flowers white, about 1/2 inch across, borne in dense rounded clusters 1 1/2 to 2 1/2 inches across, the flower-stalks and calyces densely woolly; pods 3 to 5, 1/4 to 3/4 inch long, oblong-egg-shaped with long tapering tips, smooth when mature.

Fig. 65. Pacific ninebark *Physocarpus capitatus*).

Occurrence.—OLYMPIC: Crescent Lake. MOUNT RAINIER. YOSEMITE, rare: vicinity of Carl Inn. SEQUOIA: Dorst Creek.

5. COMMON NINEBARK (*Physocarpus opulifolius* (L.) Maxim.).—Similar to Pacific ninebark but the shrubs in general somewhat smaller and less straggly; leaf-blades mostly 5-lobed, 3/4 to 2 inches long, smooth or nearly so below; flowers about 3/8 inch across, the flower-stalks and calyces smooth or only sparingly hairy.

Occurrence.—ISLE ROYALE, common: Mott Island; Lake Richie trail; Raspberry Island.

ROCKSPIREA (*Holodiscus* Maxim.)

Several varieties of rockspirea are recognized in the western national parks. Small scrubby forms found in the Southwest are quite in contrast to the beautiful shrubs of the Pacific Northwest with their large sprays of creamy-white flowers. The foliage is browsed to a certain extent by deer and elk.

FIELD GUIDE TO THE VARIETIES

Shrubs 3 to 6 feet high, or sometimes taller and almost tree-like; leaf-blades thinnish, 3/4 to 3 inches long; flower-clusters much-branched, 3 ot 12 inches long.

Leaves slightly hairy; Pacific coast species ..... 1. *H. discolor.*

Leaves usually densely white-silky below, found in Rocky Mountain National Park ..... 1a. Var. *dumosus.*

Shrubs 1 to 4 feet high; leaf-blades thickish, 1/4 to 3/4 inch long; flower-clusters not branched or with few branches, 1/2 to 4 inches long.

Leaf-blades 1/3 to 3/4 inch long, hairy, green above, paler below or white-silky; occurs in Sierra Nevada parks ..... 1b. Var. *microphyllus.*

Leaf-blades 1/4 to 1/2 inch long, green on both sides, more or less hairy, gland-dotted at least below; found mostly east of the Great Western Divide ..... 1c. Var. *glabrescens.*

1. CREAMBUSH ROCKSPIREA, OCEANSPRAY (*Holodiscus discolor* (Pursh) Maxim.), fig. 66.—Spreading shrubs 3 to 15 feet high; bark grayish; leaves egg-shaped to elliptic, the margins coarsely and irregularly toothed, green above, paler and softly hairy below, 1 to 3 inches long; flower-clusters large, broad, about 3 to 12 inches long, often 8 inches broad, tending to droop; flowers tiny, creamy white, later becoming discolored and brownish

as the tiny capsules develop. (Syn. *Spiraea discolor* Pursh, *Sericotheca discolor* Rydb.).

Occurrence.—OLYMPIC, common, up to 2,000 feet: Mount Angeles; Hayes River trail; trail to Constance Ridge; Duckabush River. MOUNT RAINIER, common: head of Carbon River, 3,800 feet; Nisqually Valley. CRATER LAKE, rare at lower elevations: lower Annie Creek canyon; Crescent Ridge; near Pole Bridge. GLACIER, occasional, 3,000 to 6,000 feet: Belton Hills; Lake McDonald; highway along St. Mary Lake; upper Coal Creek.

1a. BUSH ROCKSPIRAEA (Var. *dumosus* (Nutt.) Dippel).—Erect shrubs 3 to 6 feet high; leaf-blades ¾ to 2 or more inches long, densely white-silky below; flower-clusters much-branched. (Syn. *Spiraea dumosa* Nutt.).

Occurrence.—ROCKY MOUNTAIN, in rocky canyons.

Fig. 66. Creambush rockspiraea (*Holodiscus discolor*).

1b. MOUNTAIN ROCKSPIRAEA (Var. *microphyllus* (Rydb.) Jepson), fig. 67.—Low compact shrub 1 to 3 feet high; leaf-blades 1/4 to 3/4 inch long, wedge-shaped, green above, paler and densely silky below, often finely hairy above; flower-clusters narrow, 1/2 to 3 inches long, unbranched or with few simple branches. (Syn. *Holodiscus discolor* var. *dumosus* Jepson, in part.)

Occurrence.— YOSEMITE, common, 4,000 to 10,000 feet: Mirror Lake; Ledge trail; below Nevada Falls; Half Dome; Tioga road; Lake Eleanor. KINGS CANYON: East Lake; near Sphinx Creek. SEQUOIA, occasional, 6,000 to 11,000 feet; Giant Forest; Alta Peak; Lodgepole campground; Mount Whitney; Pinto Lake.

Fig. 67. Mountain rockspiraea (*Holodiscus discolor* var. *microphyllus*).

Fig. 68. Smooth rockspiraea (*Holodiscus discolor* var. *glabrescens*).

1c. SMOOTH ROCKSPIRAEA (Var. *glabrescens* (Greenm.) Jepson), fig. 68.—Much-branched shrubs 1/2 to 3 feet high; leaves 1/4 to 1/2 inch long, thinly hairy and gland-dotted below and often so above, green on both sides; flower-clusters narrow, 2 to 4 inches long, unbranched or with few simple branches. (Syn. *Spiraea dumosa* Torr., not Nutt.; *Sericotheca Schaffneri* Rydb., as to Grand Canyon plants.)

Occurrence.—CRATER LAKE, common, about 7,000 feet: Timber Crater; rim of Crater Lake; Mount Scott; Wizard Island; Union Peak. LASSEN, occasional, 6,000 to 9,000 feet: Lassen Peak; Brokeoff Mountain; Manzanita Lake. BRYCE CANYON: Bryce Point; Far View just below edge of cliff. ZION: west entrance checking station, 5,700 feet. GRAND CANYON, 6,500 to 9,100 feet. North Rim, common near edge of rim: Grand Canyon Lodge; Bright Angel Point; Point Imperial; Neal Spring; Bright Angel Spring. Canyon, below North Rim: Kaibab trail.

SPIRAEA, MEADOWSWEET (*Spiraea* L.)

The generic name, *Spiraea*, comes from an old world species which had spirally twisted fruits. In the western national parks the spiraeas are mostly low shrubs with showy clusters of tiny white or rose-pink flowers. The flowering period is long for most of the species, extending over most of the summer season. For this reason they are among the more conspicuous of the flowering plants usually seen by visitors to the northern parks. The herbage does not furnish very good browse for animals, but is eaten to a certain extent, especially after frost. Some species are widely cultivated.

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Flower clusters flat-topped or slightly rounded.

Flowers white; shrub with erect stems 1 to 3 feet high from a creeping rootstock; common in the Rocky Mountains and at Mount Rainier National Park ..... 1. *S. lucida.*

Flowers rose-pink; a widely-branched bushy shrub 1 to 4½ feet high; common on Pacific Slope ..... 2. *S. densiflora.*

Flower-clusters elongate-cylindric.

Leaves smooth above and below; flowers white or pink.

Leaves sharply-toothed nearly to base, sharp-pointed at the tips; flower-clusters rather broad at base; flowers white or pinkish; eastern species ..... 3. *S. latifolia.*

Leaves toothed above middle, blunt-pointed at tips; flower-clusters narrow; flowers rose-pink; western species ..... 4. *S. Menziesi.*

Leaves smooth above, white-cottony below; flowers rose-pink ..... 5. *S. Douglasi.*

1. SHINYLEAF SPIRAEA (*Spiraea lucida* Dougl.), fig. 69.—Low shrub, 1 to 3 feet high, usually with single erect stems from trailing rootstocks; leaves elliptic to egg-shaped, ¾ to 2 inches long, coarsely toothed towards the tip, smooth on both sides; flowers small, white, borne in dense flat-topped clusters at the ends of erect stems; found at low and middle altitudes, commonly in dry open places as in burned-over areas. This is one of the most common shrubs in Glacier National Park. Insects frequently cause galls to form in the flowers, making them appear as if in fruit.

Occurrence.—MOUNT RAINIER, 3,500 to 5,000 feet. GLACIER, abundant in open places, 3,500 to 7,000 feet: head of Waterton Valley; Swiftcurrent Lake and Valley; Two Medicine Valley; Cut Bank Valley; Lake McDonald. YELLOWSTONE, occasional: 2 miles from east entrance; north of Ashton, Idaho; Yellowstone Lake. GRAND TETON: trail to Phelps Lake, near snowshoe cabin, 6,700 feet; Teton Pass.

2. SUBALPINE SPIRAEA (*Spiraea densiflora* Nutt.), fig. 70.—Erect, spreading shrub, 1 to 5 feet high; leaves elliptic to egg-shaped, ¾ to 2 inches long, toothed at least towards the tip, smooth or very finely hairy; flowers deep rose-pink, sweet-scented, borne in flat-topped clusters at the ends of the branches, the clusters about 1 to 2 inches across; shrubs often forming rather extensive patches in meadows or on rocky slopes or ridges at high elevations. (Syn. *S. splendens* Baum.).

Occurrence.—OLYMPIC, 4,000 to 5,500 feet: source of Boulder Creek, above Olympic Hot Springs; Seven Lakes Basin; East Fork Quinault River. MOUNT RAINIER, occasional, 4,000 to 6,500 feet: trail to Reflection Lake; Paradise Valley; small lake above Chain Lakes. CRATER LAKE, common, 5,000 to 6,000 feet: below Annie Springs; Vidae Falls; Castlecrest Garden; west of park headquarters; Copeland Creek. LASSEN: Lassen Peak. YOSEMITE, occasional, 4,000 to 9,500 feet: Yosemite Falls; Lake Tenaya; Lake Merced; Kibbe Creek; north of Johnson Lake; Royal Arch Lake; east of Smedberg Lake; Matterhorn Canyon; Isberg Pass trail near Cascade Creek and base of El Capitan. KINGS CANYON: East Lake. SEQUOIA, occasional, 7,000 to 9,500 feet: above Tamarack Lake; Twin Lakes; Alta Peak; Tocopah Falls. GLACIER, 4,300 feet to timberline: Swiftcurrent Lake; trail to Grinnell Glacier; Three-top Mountain trail; Logging Mountain; Garden Wall trail; Cut Bank Valley; Gunsight Lake; Crossley Lake trail to Indian Pass. YELLOWSTONE, occasional. GRAND TETON, occasional: Cascade Canyon trail.

3. BROADLEAF MEADOWSWEET SPIRAEA (*Spiraea latifolia* (Ait.) Borkh.).—Erect shrub up to 4½ feet high with reddish-brown branches, the stems angled; leaf-blades oblong to reverse-egg-shaped, pointed at both ends, 1½ to 3 inches long, coarsely toothed, smooth, green above, paler or rather bluish below; flowers white or pinkish, borne in erect broadly pyramidal clusters; stamens longer than the petals; fruits smooth with spreading style. (Syn. *S. salicifolia of* American authors, in part.)

Occurrence. — ISLE ROYALE: Rainbow Cove; Washington Creek.

Fig. 69. Shinyleaf spiraea (*Spiraea lucida*).

Fig. 70. Subalpine spiraea (*Spiraea densiflora*)

4. MENZIES SPIRAEA (*Spiraea Menziesi* Hook.).—Erect shrub, 2 to 6 feet high with reddish to brown bark; leaves oblong, toothed toward the tip, green and smooth above, somewhat paler below, 1 to 3 inches long; flowers rose-colored, borne at the ends of the branches in dense, narrow clusters 2 to 5 inches long.

Occurrence.—OLYMPIC: Low Divide near base of Mount Seattle, 3,700 feet. MOUNT RAINIER: near Kautz Creek bridge; Nisqually Valley.

5. DOUGLAS SPIRAEA (*Spiraea Douglasi* Hook.), fig. 71.—Similar to Menzies spiraea but the leaves finely and softly white-cottony below.

Occurrence.—OLYMPIC: Lake Crescent. MOUNT RAINIER, common in swamps or on lake margins. CRATER LAKE, rare, 4,500 to 5,100 feet: North Fork Castle Creek; Annie Creek at south entrance. LASSEN, common at lower elevations.

Fig. 71. Douglas spiraea (*Spiraea Douglasi*).

ROCKMAT (*Petrophytum* (Nutt.) Rydb.)

There are two species of *Petrophytum* in the western parks. Both are very small herb-like shrubs with prostrate woody stems and dense tufts of small leaves at the bases of the short erect flowering stems. The plants grow commonly on rocks in the mountains and are often found clinging in the cracks of perpendicular rock faces. While the plants are very small, the flowers resemble those of the spiraeas and are considered as such by some botanists. They are white and borne in narrow cylindric clusters about ½ to 1½ inches long.

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Leaves 3-nerved, ¼ to ¾ inch long, nearly smooth or only sparingly hairy; occurs in Olympic National Park ..... 1. *P. Hendersoni.*

Leaves 1-nerved, 1/6 to ½ inch long, hairy; occurs in Sequoia and Southwest parks ..... 2. *P. caespitosum.*

1. HENDERSON ROCKMAT (*Petrophytum Hendersoni* (Canby) Rydb.) — Low alpine shrub 2½ to 6 inches high; leaves ¼ to ¾ inch long, mostly smooth or nearly so, forming basal tufts or rosettes at base of flowering stems; flowers small, white, borne in dense cylindric clusters 1 to 2 inches long on erect stems up to about 6 inches high.

Occurrence.—OLYMPIC, occasional on cliff faces, about 4,000 to 5,000 feet: Martin's Lake northeast of Low Divide; Mount Seattle; Mount Carrie; Lake Constance; Mount Storm King; Mount Angeles; Appleton Peak; Boulder Peak.

2. TUFTED ROCKMAT (*Petrophytum caespitosum* (Nutt.) Rydb.).—Low, prostrate alpine shrub often forming dense cushions or mats several feet in diameter; leaves 1/6 to ½ inch long or less, more or less pointed at the

tips, finely silky-hairy, forming basal rosettes at base of flowering stems; flowers small, white, borne in cylindric clusters ½ to 1½ inches long on erect silky stems 2½ to 6 inches high. The plant from Sequoia, with less hairy stems and leaves, is sometimes designated as *P. acuminatum* Rydb. The sepals have longer pointed tips. (Syn. *Spiraea caespitosa* Nutt.).

Occurrence.—SEQUOIA, rare, on east side of the Great Western Divide: Big Arroyo. ZION. GRAND CANYON. South Rim: Grand Canyon Village, 6,870 feet. Canyon, on north side of Colorado River: Kaibab trail above Roaring Springs.

MOUNTAIN DRYAD (*Dryas* L.)

The mountain dryads are dwarf creeping shrubs with their stems trailing over rocks. White mountain dryad is found usually in high mountain passes where it often forms large, dense, cushion-like mats. The yellow mountain dryad occurs on high rocky talus slopes or along rocky river bars in the lower valleys at Glacier National Park. The flowers of the former are white with spreading petals, while those of the latter are yellow with erect petals. The leaves are very much alike in the two species, but are very different from those of any other plants found growing in areas where mountain dryads occur. They are dark green above, densely white-felty below, with prominent indented or sunken veins, the margins inrolled, with rounded teeth. During the late summer the plants are conspicuous because of the fluffy white or tawny fruiting heads borne on erect stems.

FIELD GUIDE TO THE SPECIES

Petals white, spreading; sepals mostly linear or narrowly oblong to lance-shaped; flower stems becoming 2 to 6 inches long in fruit ..... 1. *D. octopetala.*

Petals yellow, erect to form a cup-like flower; sepals mostly broadly lance-shaped to egg-shaped; flower stems becoming 6 to 10 inches long in fruit ..... 2. *D. Drummondi.*

Fig. 72. Mount Washington dryad (*Dryas octopetala*).

1. MOUNT WASHINGTON DRYAD (*Dryas octopetala* L.), fig. 72. — Leaf-blades mostly rounded or somewhat heart-shaped at base; flowers white, sometimes drying light yellowish or cream-color, about ¾ to 1 inch across, the petals spreading; sepals usually narrowly lance-shaped to linear, these and the cup below often sparingly black-hairy; flower stems single-flowered, ¼ to 2 inches long, becoming 1½ to 4 inches long in fruit.

Occurrence. — MOUNT RAINIER, rare, 7,000 to 8,500 feet. GLACIER, common, 7,000 feet and above: Mount Altyn; Swiftcurrent Pass; trail to Swiftcurrent lookout; Piegan Pass; Hidden Lake Pass; Cutbank Pass; Triple Divide Pass; near Gunsight Pass; Ahern Pass. YELLOWSTONE, common: Mt. Holmes; Electric Peak; Beartooth Mountains. GRAND TETON: tableland at head of Death Canyon, 9,800 feet. ROCKY MOUNTAIN, common above timberline; Long's Peak, 11,000 feet.

2. DRUMMOND DRYAD (*Dryas Drummondi* Rich.).—Leaf-blades mostly more or less wedge-shaped at base, often with an extra tooth on the leaf-stalk below the blade; flowers bright yellow; petals about 3/8 inch long, erect to form a cup-like flower; calyx densely black-hairy, the sepals usually broadly lance-shaped to egg-shaped; flower stems mostly single-flowered, sometimes 2-flowered, 1 to 3 inches long, elongating to as much as 8 or 9 inches in fruit, the petals often long-persistent.

Occurrence.—GLACIER, occasional, on river bars, 3,500 to 7,000 feet: Mount Siyeh; Blackfoot Glacier; along creek near St. Mary checking station; creek along trail above Crossley Lake; North Fork Flathead River near mouth of Logging Creek.

MOUNTAIN MAHOGANY (*Cercocarpus* H. B. K.)

The mountain mahoganies are especially noted for their heavy, mahogany-red wood. The plants seem well adapted to poor, gravelly or rocky soil on dry mountain slopes and ridges where they are commonly found. The flower is composed of a narrow tube which looks something like a short, thick stem with an expanded cup-like upper portion to which the stamens are attached. There are no petals. The fruits are seed-like, tipped by long, white-hairy tails which help in scattering the seed. The generic name, *Cercocarpus*, is derived from two Greek words referring to this character of the fruits, *kerkos* (a tail) and *karpos* (a fruit). The roots of the mountain mahogany have long been used by the Indians of the Southwest to make a beautiful red dye. A variety of shades can be obtained by adding ashes, cactus fruits, or other ingredients. The wood is extremely hard and dry and burns for a long time, producing a very hot fire. Hence it is a favorite fuel for local residents in certain areas.

FIELD GUIDE TO THE SPECIES

Leaves reverse-egg-shaped to oval, more or less toothed above the middle, thickish but not stiff and leathery; tails in fruit 2 to 3 1/2 inches long.

Leaves with mostly small pointed teeth; occurs in California parks ..... 1. *C. betuloides.*

Leaves with mostly coarse broad teeth; occurs in parks of the Southwest ..... 2. *C. montanus.*

Leaves linear to oblong or elliptic, not toothed, stiff and leathery, the margins inrolled; tails in fruit 3/4 to 3 inches long.

Leaves 1/2 to 2 inches long, oblong to elliptic, the margins not inrolled to the midrib; tails of fruits 1 1/2 to 3 inches long ..... 3. *C. ledifolius.*

Leaves 1/4 to 1 inch long, linear, the margins inrolled to or almost to the midrib; tails of fruits 3/4 to 1 3/4 inches long ..... 4. *C. intricatus.*

1. BIRCHLEAF MOUNTAIN MAHOGANY (*Cercocarpus betuloides* Nutt.), fig. 73.—Shrub 2 to 10 feet high, or a small tree up to 28 feet high; resembling scrub birch, thickish, 1/2 to 2 inches long, reverse-egg-shaped, broad and toothed at the tip, tapering to the base, yellow-green above, paler below, conspicuously veined, more or less bunched on short woody, peg-like branchlets; flowers borne in groups of 2 to 6, the cup-like portion about 1/4 inch across, the flower tube in fruit becoming reddish-brown and splitting down one side; fruits borne singly or in groups of 2 or more, seed-like, with long hairy tails

2 to 3½ inches long. The plants sprout from the root crown after fire. The foliage is browsed by deer. In the tall chaparral just west of Sequoia National Park, the plants may become as much as 28 feet high. In dense stands on the moist north slopes the stems grow so erect that straight pieces 13 feet long and 3 to 4 inches in diameter may be obtained.[26]

Birchleaf mountain mahogany is very similar to the mountain mahogany of the Southwest, but the leaves are usually more finely toothed.

Occurrence.—YOSEMITE, common, 4,000 to 6,200 feet: Wawona; Alder Creek ranger station; near El Portal; near Hetch Hetchy dam. SEQUOIA, common, 1,500 to 6,000 feet; Marble Fork Kaweah River; east of Clough Cave; along trail to Yucca Creek.

2. TRUE MOUNTAIN MAHOGANY (*Cercocarpus montanus* Raf.), fig. 74.—Erect shrub 3 to 9 feet high with grayish-brown bark; leaves oval to reverse-egg-shaped, 2 to 4 inches long, coarsely toothed above the middle, dark green and becoming smooth above, pale and finely fuzzy below, rounded

Fig. 73. Birch mountain mahogany (*Cercocarpus betuloides*).

26 Jepson, W. L., Flora of California, vol. 2, p. 217. 1936.

or blunt at the tips, wedge-shaped at base; fruiting styles 2 to 3 inches long. (Syn. *C. parvifolius* Nutt.).

Occurrence.—MESA VERDE, abundant: near park headquarters; Soda Canyon. BRYCE CANYON, abundant, 7,000 to 7,500 feet: edge of rim near Bryce cafeteria; northeast part of park; near checking station. ZION, abundant, 5,700 to 7,100 feet: Horse Pasture Plateau; east of Great White Throne; West Rim trail above ranger cabin; near Checkerboard Mesa. GRAND CANYON, 6,000 to 8,800 feet. North Rim, common: Uncle Jim Point; Point Imperial; Powell Spring. South Rim, occasional at edge of rim and just below: rim trail between Shoshone and Yaki Points. Canyon, common: Hermit trail; Bright Angel trail; Berry trail; Kaibab trail on Cedar Ridge near fossil fern quarry; above Roaring Springs.

3. CURL-LEAF MOUNTAIN MAHOGANY (*Cercocarpus ledifol.us* Nutt.), fig. 75.—Shrub 3 to 10 feet high, or a small, scraggly, round-topped tree, sometimes 20 feet high with short, crooked trunk; bark grayish to brownish, thin and scaly; leaves ½ to 2 inches long, thick and leathery, oblong, the margins inrolled, shiny dark green or sometimes finely fuzzy above, whitish or yellowish below; flowers small, stemless, without petals, borne singly or 2 to 3 arising from a leaf-axil; fruits small, hairy seeds with long, slender, feathery tails 1½ to 3 inches long.

Fig. 75. Curl-leaf mountain mahogany (*Cercocarpus ledifolius*).

Fig. 74. True mountain mahogany (*Cercocarpus montanus*).

Curl-leaf mountain mahogany is so-called because of the leaves which have the margins curled under from the sides. In this respect they resemble the leaves of labrador tea (*Ledum*), which accounts for the specific name, *ledifolius*. The leaves are quite stiff and leathery, but in some areas the species provides important winter forage for deer and elk. The wood is so hard that in an emergency it has been possible to use it for engine bearings.[27] The Indians of certain regions used the stems to make their bows. The species occurs typically in the Great Basin area, that is, between the Great Western Divide and the Continental Divide.

27 Jepson, W. L., Flora of California, vol. 2, p. 217. 1936.

Occurrence.—LASSEN. SEQUOIA, common on the east side of the park, 6,800 to 11,000 feet: road to Milk Ranch Peak; 1/4 mile south of Kern Hot Spring; Kern Canyon below Junction Meadow. BRYCE CANYON, occasional, 6,800 to 7,700 feet: near checking station; Bryce Point. ZION, 7,000 to 8,000 feet: Horse Pasture Plateau. GRAND CANYON. North Rim, common at edge of rim: Bright Angel Point; Point Imperial. South Rim, rare: Grand View.

4. LITTLELEAF MOUNTAIN MAHOGANY (*Cercocarpus intricatus* Wats.), fig. 76.—A low, intricately branched shrub 2 to 4 (or rarely up to 8) feet high; leaves elongated, narrow, evergreen, 1/4 to 1 inch long, dark green above, whitish below, the margins curled under almost to the midrib; flowers solitary, inconspicuous; fruits with white hairy tails 3/4 to 1 1/4 inches long. (Syn. *Cercocarpus arizonicus* Jones).

This shrub is closely related to curl-leaf mahogany, but it usually has smaller leaves which are so strongly inrolled that they appear linear and almost cylindrical. The stiff leathery leaves are sometimes utilized by deer during the winter when other food is scarce.

Fig. 76. Littleleaf mountain mahogany (*Cercocarpus intricatus*)

Occurrence.—KINGS CANYON: Kings Canyon above Cedar Grove. SEQUOIA, about 7,500 feet: Rattlesnake Creek trail; west wall of Kern Canyon. ZION, 4,500 to 6,000 feet: upper Emerald Pool; Checkerboard Mesa. GRAND CANYON, 4,000 to 7,800 feet. North Rim, rare: Cape Royal. South Rim, common: Lipan Point; trail to Powell Memorial; Yavapai Point. Canyon, common on rocky points: Cathedral Stairs; Hermit trail; Bright Angel trail; Kaibab trail on switchbacks below Tip-off; Roaring Springs canyon above Devil's Backyard.

BLACKBRUSH (*Coleogyne ramosissima* Torr.), fig. 77.—Rather low bushy shrub 1 to 5 feet high with spine-tipped branchlets; leaves small, leathery, narrowly club-shaped to linear, borne opposite and tending to be bunched along the stems; flowers about 1/2 inch across, without petals, the calyx yellow on the inside and divided into 4 spreading petal-like lobes; fruit a seed-like achene enclosed by a sheath-like tube.

Fig. 77. Blackbrush (*Coleogyne ramosissima*).

Fig. 78. Stansbury cliffrose (*Cowania Stansburiana*).

This is a characteristic species on the desert slopes and mesas in certain parks of the Southwest. It is common on the Tonto in the Grand Canyon where it often forms dense spiny thickets. Although the leaves are small, the bushes furnish fair forage for deer, especially during the winter.

Occurrence.—BRYCE CANYON. ZION, 3,700 to 5,500 feet: Petrified Forest; Coalpits Wash; along the Zion-Mount Carmel highway. GRAND CANYON, abundant in the canyon, 3,000 to 5,500 feet: Tonto Platform, 1/2 mile south of Plateau Point; Hermit trail; Bright Angel trail near Indian Gardens; Kaibab trail on the Tonto.

STANSBURY CLIFFROSE (*Cowania Stansburiana* Torr.), fig. 78.—Much-

branched evergreen shrub or small gnarled tree 1 to 7 feet high; bark reddish-brown, becoming gray and very shreddy; young twigs showing numerous leaf scars; leaves small, about 1/4 to 1/2 inch long, deeply lobed or divided, dark green above, densely white-hairy below, the edges curling under so that only a white line shows down the middle of each lobe, tending to occur in small bunches on short branchlets along the stems; flowers white, 1/2 to 1 inch across, with 5 white petals; fruits seed-like achenes tipped with long white-fuzzy tails 1 to 2 inches long, 4 to 10 (usually 5) to each flower.

The species seems to favor dry rocky locations, often below cliffs, hence the common name, cliffrose. During the Spring and early Summer when the bushes are densely covered with conspicuous white flowers, it is one of the most showy species lining the roadsides in some of the parks of the Southwest. In spite of the bitter foliage, the shrub is an important winter browse for deer. The Indians of the Southwest used the leaves in a decoction for the treatment of fevers. It is sometimes called quinine-bush because of the bitter herbage.

Occurrence.—MESA VERDE. BRYCE CANYON. ZION, common, 4,000 feet: south side of Zion Canyon near south entrance. GRAND CANYON, 4,000 to 8,000 feet. North Rim, on open flats near edge of rim: Cape Royal; Bright Angel Point; Point Sublime. South Rim, abundant: east and west rim drives; Yavapai Point; Grandview; west of Rowe's Well; near Rampart Point; east of Hermit's Rest. Canyon, common: Hermit trail; Bright Angel trail; Kaibab trail; Mormon Flats.

APACHEPLUME (*Fallugia paradoxa* (D. Don) Endl.), fig. 79.—Much-branched, usually round-topped shrub, 1 to 6 feet high, with slender branches; bark light gray or whitish, the older bark shreddy; leaves small, 1/4 to 3/4 inch long, thickish, deeply divided into several lobes, often rusty on the under surface, tending to be bunched along the stems; flowers white, 1 to 1 1/2 inches across, with 5 petals; calyx with small lance-shaped or oblong bractlets between the calyx-lobes; flowers white, 1 to 1 1/2 inches across, the petals 5; fruits small seed-like achenes with long, white-hairy tails 1 inch or more long, packed into dense fluffy heads 1 1/2 to 2 inches in diameter.

Fig. 79. Apacheplume (*Fallugia paradoxa*).

Apache-plume is one of the common shrub species of the Southwest where it usually occurs scattered on sandy or gravelly slopes or on dry, rocky ridges. The common name comes from the

fancied resemblance of the feathery fruiting heads to the eagle-plumed war bonnets of the Apache Indians.[28] They may also be compared to miniature old-fashioned feather dusters. The herbage furnishes good browse, especially during the winter. The bushes are very resistant to over-browsing and show excellent recuperative powers, even though they are eaten back year after year. The Indians used the straight branches for arrow shafts.

Occurrence.—ZION: Coalpits Wash, 3,600 feet. GRAND CANYON, 2,500 to 7,500 feet. North Rim, rare: Point Sublime. South Rim, occasional: west of Hermit's Rest; West Rim Drive near the Abyss; trail to Powell Memorial; Yavapai Point in the garden. Canyon, abundant: Bright Angel trail 1½ miles above Indian Gardens: Garden Creek below Indian Gardens; Kaibab trail below South Rim; near Phantom Ranch; Bright Angel Creek above Phantom Ranch; north of Cottonwood Camp; Nankoweap Basin; Little Colorado River.

ANTELOPE BITTERBRUSH (*Purshia tridentata* (Pursh) D. C.)—A grayish green, intricately-branched shrub 1½ to 8 feet high with brown or grayish bark; leaves small, thick and leathery, wedge-shaped, about ¼ to ¾ inch long, finely white-felty below, 3-toothed at the tip, the side margins tending to be inrolled, occurring usually in small bunches on short branchlets; flowers yellow, about ½ inch across, with 5 petals, borne along the stems on short branchlets; fruits small, seed-like structures narrowed to a slender point at the tip and tapering to the base, borne singly or sometimes in 2's.

Bitterbrush is one of the most common shrubs in the Southwest, occurring usually on dry plains or on hot south-facing slopes. The herbage is very bitter, as the common name implies, but in spite of this, it is a very valuable winter and early spring browse for deer and elk. A decoction of the leaves was used by the Indians as a cough medicine.[29]

Occurrence.—CRATER LAKE, rare: near south entrance to park. LASSEN, rare: Hot Springs Valley, 5,500 feet. SEQUOIA, rare: near southeastern park boundary. YELLOWSTONE, rare, 6,600 feet: west entrance. GRAND TETON, rare: 2 miles south of park headquarters, 6,600 feet. ROCKY MOUNTAIN, occasional, 8,500 feet: 1 mile south of Deer Mountain. MESA VERDE. BRYCE CANYON, common near edge of cliff: near park headquarters; near Bryce Lodge; along the rim drive; Far View; Inspiration Point. ZION, occasional, 5,000 to 7,000 feet: West Rim trail above ranger cabin; base of Checkerboard Mesa.

GREASEWOOD CHAMISE (*Adenostoma fasciculatum* H. & A.).—Densely-branched evergreen shrub, 2 to 10 feet high, with resinous sticky foliage; bark brown, shreddy on the older stems; leaves dark green, small, needle-like, about ⅛ to ⅜ inch long, thick and rigid, crowded in small bundles along the stems; flowers white, in densely-branched feathery clusters at the ends of the branches; fruits small, hard, 1-seeded achenes.

Greasewood chamise is one of the most widespread and abundant of the foothill shrubs in California. In Sequoia National Park it is common in the foothill region below the ponderosa pine belt. The small green leaves borne in clusters along the stems give the plant a heath-like appearance. The species

[28] Range Plant Handbook B 77: United States Department of Agriculture, Forest Service. 1937.

[29] Stuhr, E. T., Manual of Pacific Coast Drug Plants. 120. 1933.

name, *fasciculatum,* from the Latin meaning little bundle, refers to this arrangement of the leaves. Because of the inflammability of the resinous oil in the foliage, chamise is a serious fire hazard on dry slopes where it commonly forms dense impenetrable thickets. Oil obtained from the herbage is said to have been used by the Indians as a remedy for skin affections.[30]

Occurrence.—SEQUOIA, common, 2,500 to 3,000 feet: along western park boundary; trail to Ash Mountain lookout.

PEA FAMILY (Leguminosae)

FIELD GUIDE TO THE GENERA

Leaves simple, not divided into separate leaflets; flowers red-purple.

Tall, many-stemmed shrubs or small trees; leaves round, 2 or more inches across; flowers somewhat pea-like; pods elongate, flat, smooth ..... CERCIS, p. 144.

Low, intricately branched shrubs; leaves lance-shaped to linear, ½ inch or less long; flowers with spreading petal-like sepals; pods globose, spiny ..... KRAMERIA, p. 145.

Leaves divided into few to many leaflets; flowers various colors.

Flowers not pea-like, yellow.

Leaves once divided into simple leaflets; low shrubs, not spiny; flowers about 1 inch across ..... CASSIA, p. 146.

Leaves twice divided into many leaflets; tall shrubs or small trees, the branches spiny; flowers tiny, packed into dense elongate heads.

Spines straight, usually paired at leaf bases ..... PROSOPIS, p. 146.

Spines curved and claw-like, usually borne singly ..... ACACIA, p. 146.

Flower pea-like, pink, blue, or yellow.

Leaflets 3; flowers yellow; rare in Olympic National Park .... CYTISUS, p. 147.

Leaflets more than 3; flowers pink or blue to purplish.

Leaflets pinnately divided; shrubs of the Southwest.

Tall shrubs or small trees with spiny stems; flowers rose-pink; pods 2 to 5 inches long ..... ROBINIA, p. 148.

Low shrubs, not spiny; flowers purple-blue; pods less than ½ inch long ..... DALEA, p. 149.

Leaflets palmately divided; found mostly on Pacific slope ..... LUPINUS, p. 149.

CALIFORNIA REDBUD (*Cercis occidentalis* Torr.), fig. 80.—Usually a shrub with many stems spreading from the base, or sometimes a small tree 15 feet high with a round bushy crown and short trunk 2 to several inches in diameter; bark thin, smooth; leaves 1½ to 3½ inches across, round, heart-shaped at the base; flowers small, pea-like, purplish-red, borne along the stems before the leaves appear; pods flat, 1½ to 3 inches long and often ¾ inch wide, becoming reddish-brown; seeds flattened, orbicular, somewhat resembling lentils. (Syn. *Cercis arizonica* Rose.)

The common name, redbud, is descriptive of the flowering stage when the long leafless stems are covered with dark purplish-red flowers which resemble the buds of sweet peas. The bushes are conspicuous also in late

30 Stuhr, E. T., Manual of Pacific Coast Drug Plants, 117. 1933.

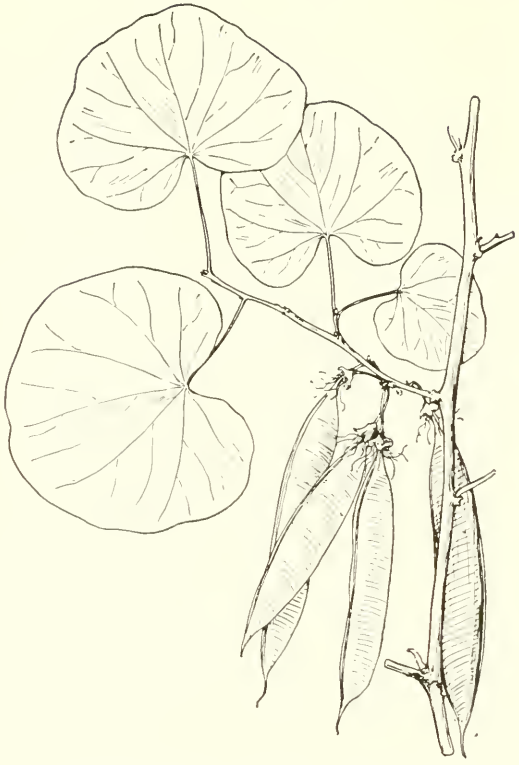

Fig. 80. California redbud (*Cercis occidentalis*).

Summer and Fall because of the large clusters of long reddish-brown pods hanging from under the leaves.

Occurrence.—YOSEMITE, common in the foothills and at the mouths of the canyons; vicinity of El Portal. SEQUOIA, common, 1,600 to 5,000 feet: vicinity of Ash Mountain; Mineral King road; near Clough Cave. GRAND CANYON, in the canyon, 3,500 to 6,000 feet: Bright Angel trail 1½ miles below South Rim; Indian Gardens; Kaibab trail on Tonto north of Colorado River; along trail above Roaring Springs; Hermit trail.

RANGE KRAMERIA, RANGE RATANY (*Krameria parvifolia* Benth. var. *glandulosa* (Rose & Paint.) McBr.).—Low rigidly branched shrub 1 to 2 feet high with branches spreading close to the ground; leaves linear, ¼ to ½ inch long; flowers purple, about ½ inch across, irregular; sepals and petals 5, the sepals large and petal-like, hairy on the back; pods 1-seeded, egg-shaped to heart-shaped, bur-like with slender barbed spines.

This is a plant of the hot desert country which is usually found in gravelly soils, sometimes in such abundance as to give a bluish-green or purplish cast to the landscape. For this reason, it is sometimes called purple heather. It

has also been called heart-nut because of the fruits which are sometimes heart-shaped at the base. These bur-like pods may cling to the coats of grazing animals which thus aid in the distribution of the species.

Occurrence.—ZION. GRAND CANYON, in the bottom of the canyon.

Fig. 81. Hairy senna (*Cassia Covesi*).

HAIRY SENNA (*Cassia Covesi* Gray), fig. 81.—Low spreading shrub 1 to 2 feet high, the herbage finely velvety; leaves divided into 2 or 3 pairs of opposite leaflets, the leaflets oval to elliptic or oblong, ½ to 1 inch long; flowers few at the ends of the flowering branches; petals 5, yellow, about ½ inch long; pods oblong, ¾ to 1¼ inches long, about ¼ inch wide; splitting down both sides; seeds several.

Occurrence. — GRAND CANYON, in the canyon, 2,500 to 4,000 feet: Colorado River near suspension bridge; Clear Creek trail above Phantom Ranch.

HONEY MESQUITE (*Prosopis chilensis* (Mol.) Stuntz. subsp. *glandulosa* (Torr.) Standl.).—Much-branched shrub 6 to 10 feet high or a small tree; stems armed with straight sharp spines, these usually borne in pairs at the base of the leaves; leaves divided into 2 (or 4) leaflets, these again divided into 9 to 18 pairs of small oblong leaflets ¼ to ½ inch long; flowers tiny, yellowish, borne in slender cylindrical clusters 2 to 3½ inches long, the clusters usually nodding or drooping from the leaf-axils; pods flattened, linear, 3 to 8 inches long, curved, somewhat constricted between the seeds, borne in drooping clusters of 1 to several. (Syn. *P. juliflora* DC. var. *glandulosa* Torr.).

Honey mesquite is a characteristic plant of the desert regions. It is exceptionally drought-enduring and is valuable as a soil binder in erosion control work. The flowers are an important source of a fine quality honey, hence the common name, honey mesquite. The fleshy pods, which are sweet and nutritious, were gathered by the Indians of the Southwest, who ground them into a meal (pinole) which was used for making a mush. Growing as it is in an area where wood is scarce, the roots and stems of this species are highly valued as fuel. Although the leaflets are small and of little value as food for animals, the young twigs are browsed in early Spring.

Occurrence.—ZION. GRAND CANYON, in the canyon, 2,000 to 3,500 feet: Phantom Ranch; Colorado River near suspension bridge; Havasu Canyon.

CATCLAW ACACIA (*Acacia Greggi* Gray), fig. 82.—Usually a straggly shrub, or sometimes a small much-branched tree up to 20 feet high with a short trunk sometimes 8 inches in diameter; stems armed with stiff backwardly-curved claw-like spines; leaves twice pinnately divided into very small

oblong to nearly linear leaflets; flowers tiny, yellow, packed in dense oblong clusters about 1 to 2 inches long; pods 2 to 6 inches long, pale brown, flattened, mostly curved, strongly constricted between the seeds, ripening in the Fall and often remaining on the branches for periods of from 6 to 8 months; seeds nearly orbicular, somewhat flattened like a disk, about 1/3 inch in diameter, dark, shiny brown.

Fig. 82. Catclaw acacia (*Acacia Greggi*).

This species is typically a desert or semi-desert shrub characteristic of the creosote belt of the Southwest and frequently found in association with honey mesquite. The plants seem to thrive on poor soil and, as is characteristic of all members of the pea family, tend to improve its fertility. The common name, catclaw, is derived from the stiff, claw-like spines scattered along the stems. The scientific name is derived from the Greek, *ake*, meaning point, in reference to the thorns. Acacia has a remarkable ability to survive under adverse conditions and is often planted on desert sand dunes to bind the soil and prevent erosion. The young shoots and flowers are browsed to some extent in early Spring but the sharp spines prevent it from being extensively eaten, especially when other foliage is available. The bark exudes a gum similar to gum arabic. The flowers are an important source of honey for bees.

Occurrence.—GRAND CANYON, common on the Tonto and below, 2,500 to 4,500 feet: Kaibab trail on both sides of the Colorado River; Garden Creek below Indian Gardens; Clear Creek trail below Phantom Point; Shinumo Creek.

SCOTCH BROOM (*Cytisus scoparius* Link.).—Erect evergreen shrub; stems angled, sparsely leafy, the leaves divided into 3 leaflets; flowers bright yellow, pea-like, about 3/4 inch long, borne singly or in pairs in the leaf-axils; pods flat, the margins hairy.

This is a well-known ornamental shrub which has escaped from cultivation and has become naturalized, especially in the Northwest. In early Spring certain sections of the drive around the Olympic Peninsula are lined with the bright yellow flowers of these shrubs. The plants are drought resistant and their use has been found to be successful in erosion control work. The herbage is poisonous to livestock.

Occurrence.—OLYMPIC, rare in the park: Lake Crescent.

Fig. 83. Western locust (*Robinia luxurians*).

Fig. 84. Fremont dalea (*Dalea Fremonti* var. *Johnsoni*).

WESTERN LOCUST (*Robinia luxurians* (Dieck.) Schneid.), fig. 83.—Tall many-stemmed shrub or small tree up to 25 or 30 feet high, the stems armed with stout, straight or curved spines below the leaves; leaflets 15 to 21, oblong-elliptic to oval, ½ to 1 inch long; flowers light rose-pink, resembling pea flowers, borne in dense showy clusters; pods flat, 2 to 5 inches long, about ¼ inch wide, bristly-hairy and glandular; seeds numerous, in two rows.

The species favors the cooler mountain canyons where the large clusters of rose pink flowers are very lovely in the Spring. Locust is a favorite with honey bees. The flowers were gathered and used for food by the Indians of the Southwest. Both the leaves and flowers are eaten by mule deer on the Kaibab range of the North Rim of the Grand Canyon. (Syn. *R. neomexicana* Auth., not Gray.[31])

31 Rehder, Alfred, Manual of cultivated trees and shrubs hardy in North America, second edition, revised and enlarged, p. 511. 1940.

Occurrence.—ZION, common in the canyons, 3,700 to 4,300 feet: talus slopes along Zion Canyon road above public campgrounds. GRAND CANYON, 4,000 to 8,800 feet. North Rim, near the rim and just below: Bright Angel Point; Walhalla Plateau along road to Cape Royal; Powell Plateau; Point Sublime. South Rim, rare; rim in front of El Tovar; Dripping Springs. Canyon, common north of Colorado River above the Tonto: Kaibab trail above Roaring Springs; Cottonwood Camp.

FREMONT DALEA, DESERT BEAUTY (*Dalea Fremonti* Torr. var. *Johnsoni* (Wats.) Munz.), fig. 84.—A low shrub, 1 to 3 feet high; herbage grayish; leaves composed of opposite pairs of leaflets; leaflets narrowly oblong, 1/3 to 2/3 inch long, with several small glands on the under surface; flowers purplish-blue, pea-like, about 1/3 to ½ inch long, borne at the ends of the branchlets in dense clusters 1 to 5 inches long; fruits tiny pods about 1/3 inch long, egg-shaped, tapering abruptly to a slender up-curving point; seeds 2. (Syn. *Parosela Johnsoni* Vail.)

Occurrence.—ZION: Coalpits Wash, 3,700 feet; Shunes Creek.

LUPINE (*Lupinus* L.)

The lupines are easily recognized because of the erect spikes of pea-like flowers and the roundish leaf-blades divided from the base into several oblong or more or less wedge-shaped leaflets. The name *Lupinus* is derived from the Latin, *Lupus*, meaning wolf, from the early erroneous idea that these plants robbed the soil of its fertility. Instead they aid the soil by building up the nitrogen content. The roots of all members of the pea family harbor bacteria which are able to take nitrogen from the air and make it into compounds available to the plants. Although there are numerous species of lupine in the western national parks, very few of them are shrubby and then usually only at the base.

FIELD GUIDE TO THE SPECIES

Shrub 2 to 6 feet high; leaflets densely silky; flowers blue or purple, 1/3 to ½ inch long ..... 1. *L. albifrons.*

Herbaceous plants woody at base only; leaves and flowers various.

Plants low, 2 to 6 inches high, often forming prostrate mats; alpine species.

Leaflets 7 to 10, ¼ to nearly 1 inch long; flower clusters oval to oblong, 1 to 2 inches long; flowers violet, with yellowish or whitish center. ..... 2. *L. Breweri.*

Leaflets 5 or 6, 1/6 to ½ inch long; flower clusters mostly head-like; flowers lavender to white ..... 3. *L. Lyalli.*

Erect plants mostly more than 6 inches high.

Lower leaf-stalks mostly 1 to 5 or 7 inches long; flowers ½ inch or more long; found in California parks.

Plants ½ to 1 foot high; herbage densely hairy; flowers ½ inch long, blue with yellow centers ..... 4. *L. Grayi.*

Plants 1 to 2 feet high; leaf-blades thinly hairy or smooth above, hairy below; flowers ½ to ¾ inch long, blue or pinkish..... ..... 5. *L. laxiflorus.*

Lower leaf-stalks ¾ to 1¾ inches long; flowers about ¼ inch long; occurs in the Southwest ..... 6. *L. meionanthus.*

1. WHITEFACE LUPINE, SILVER LUPINE (*Lupinus albifrons* Benth.).—Much-branched shrub 2 to 5 feet high with densely silvery-silky herbage; leaf-blades divided into 6 to 9 leaflets, the leaflets 1/2 to 1 inch long; flowers blue or purplish, at first with white or yellow center; pods 1 to 2 inches long, 5 to 9-seeded.

Occurrence.—YOSEMITE. SEQUOIA: lower Kaweah River.

2. BREWER LUPINE, MAT LUPINE (*Lupinus Breweri* Gray).—Low prostrate plant not usually more than 6 inches high, with silvery-silky herbage; leaves crowded near the base or scattered along the stems; leaflets mostly 7 to 10, 1/4 to 3/4 inch long; flowers violet, the center yellowish or white, 1/4 to 3/8 inch long, borne in dense oblong clusters 1 to 2 inches long; pods about 3/8 inch long, 3- or 4-seeded.

Occurrence.—YOSEMITE.

3. LYALL LUPINE (*Lupinus Lyalli* Gray var. *fruticulosus* (Greene) C. P. Smith).—Low plants from woody base, the stems seldom over 4 inches high; leaflets 5 or 6, 1/2 to 3/4 inch long, appressed-silky on both sides; flowers about 1/2 inch long or less, blue to purplish, borne in usually oblong head-like clusters; pods silky, about 1/2 inch long, 3- or 4-seeded.

Occurrence.—CRATER LAKE: Annie Creek valley.

The variety *danaus* (Gray) Wats., found on Mount Dana in Yosemite National Park, and variety *Lobbi* (Gray) Smith, listed as occurring in Lassen National Park, are slightly less woody varieties.

4. GRAY'S LUPINE (*Lupinus Grayi* Wats.).—Plants 1/2 to 1 foot high; herbage densely short-hairy; leaflets 5 to 9, 1 to 1 1/2 inches long, hairy on both sides; flowers about 1/2 inch long, blue with yellow center, borne in circles on upper part of stem; pods about 1 to 1 1/4 inches long, finely appressed-hairy, 4- to 6-seeded.

Occurrence.—YOSEMITE: Wawona.

5. SPUR LUPINE (*Lupinus laxiflorus* Dougl.).—Plants 1 to 2 feet high; lower leaves long-stalked; leaf-blades thinly hairy or nearly smooth above, appressed-hairy below, divided into 7 to 9 leaflets, 1 to 1 3/4 inches long; flowers 1/2 to 3/4 inch long, blue or pinkish, borne in erect clusters 3 to 7 inches long; calyx spurred; pods 1 inch long, 4- to 6-seeded.

Occurrence.—LASSEN: woods near Manzanita Creek. YELLOWSTONE.

6. TAHOE LUPINE (*Lupinus meionanthus* Gray).—Plants 1 to 2 feet high, with densely silky herbage; leaves all on short stalks less than 1 inch long; leaflets 6 to 9, silky on both sides, 1/2 to 3/4 inch long; flowers blue or lilac, with yellow centers, about 1/4 inch long.

Occurrence.—GRAND CANYON, on the North Rim.

SPURGE FAMILY (Euphorbiaceae)

SOUTHWEST BERNARDIA (*Bernardia incana* Morton), fig. 85.—Much-branched shrub 2 to 7 feet high with dark grayish herbage; leaves alternate,

thickish, oblong to egg-shaped, 1/4 to 1 1/2 inches long, covered with a dense gray fuzz, the margins scalloped; male flowers borne in small clusters along the stems; female flowers borne singly at the ends of short branches; fruits 2- or 3-lobed capsules, about 3/8 to 1/2 inch in diameter, each lobe containing a smooth roundish seed The seeds are eaten by birds. (Syn. *B. myricaefolia* as to Arizona specimens.) [32]

Occurrence. — GRAND CANYON, in the canyon, 2,300 to 5,500 feet: Tonto on both sides of the Colorado River; Bright Angel trail 1 1/2 miles above Indian Gardens; Kaibab trail along switchbacks below Tip-off; Bright Angel Canyon above Phantom Ranch; Clear Creek trail.

Fig. 85. Southwest bernardia (*Bernardia incana*).

CALTROP FAMILY (Zygophyllaceae)

COVILLE CREOSOTEBUSH (*Larrea tridentata* (DC.) Cov.), fig. 86.—Erect, widely branching shrub 2 to 5 feet high; herbage with strong aromatic or creosote odor; leaves opposite, divided into 2 leaflets; leaflets somewhat sickle-shaped, about 1/6 to 3/8 inch long, dark green, somewhat tough and leathery; flowers about 1/2 inch across, borne singly at the ends of short branchlets; petals 5, yellow; fruits small globose pods about 1/4 inch long, densely covered with long white hairs. (Syns. *L. glutinosa* Engelm., *Covillea tridentata* Vail.)

Creosotebush is a characteristic shrub in the deserts of the Southwest, but is not found commonly in the national parks. The small, tough, resinous leaves well adapt this plant to the dry desert climate. The bushes are quite conspicuous in the spring

Fig. 86. Coville creosotebush (*Larrea tridentata*).

[32] Morton, C. V., A second United States species of Bernardia. Wash. Acad. Sci. Jour. 29: 375. 1939.

when covered with bright yellow flowers which later develop into small, white-woolly pods. The stems are sometimes covered with a gummy substance which the Indians of the Southwest used as a glue or cement to mend broken baskets. A hot water decoction of the herbage was used as a liniment for treating collar sores in draft horses.[33] The herbage is of no use as a browse, probably because of the resinous substance which gives the plants a strong aromatic odor. The stems burn easily, green or dry, and make a hot fire. Some think that burning stems give off the odor of creosote, hence the common name, creosotebush.

Occurrence.—ZION: Coalpits Wash, 4,000 feet. GRAND CANYON, in the canyon: lower Toroweap Valley west of park boundary.

ORANGE FAMILY (Rutaceae)

FIELD GUIDE TO THE GENERA

Broom-like, nearly leafless shrub; leaves not more than ½ inch long, not divided nor toothed; flowers dark purple; fruits small heart-shaped capsules ..... THAMNOSMA, p. 152.

Leafy shrub or small tree; leaves divided into 3 leaflets, the leaflets ¾ to 3 inches long; flowers greenish white; fruits small flattened roundish structures winged all around ..... PTELEA, p. 152.

MOHAVE DESERT-RUE, TURPENTINE BROOM, (*Thamnosma montana* Torr. & Frem.).—Freely-branching, broom-like shrub 1 to 2½ feet high, the stems thickly covered with glandular swellings; leaves few, small, 1/6 to ½ inch long, oblong, soon falling; flowers blackish purple, about ⅜ inch long, borne singly along the stems; petals 4, usually remaining erect; fruits 1/3 to nearly ½ inch across, deeply parted into two roundish, inflated sections and tapering to the base. A decoction of the herbage was used as a tonic by the Indians and early settlers.

Fig. 87. Baldwin hoptree (*Ptelea Baldwini*).

Occurrence. — GRAND CANYON, in the Canyon, 3,700 to 6,500 feet: Hermit Basin; Bright Angel trail; Pipe Creek; Clear Creek trail below Phantom Point; Kaibab trail on the Tonto north of the Colorado River.

BALDWIN HOPTREE (*Ptelea Baldwini* Torr. & Gray), fig. 87. —Shrub, or small tree 6 to 20 feet high; bark whitish; leaflets 3, elliptic to oblong with rounded or pointed tips, ¾ to 2¾ inches

33 Jepson, W. L. Flora of California, vol. 2, p. 439. 1936.

long, the margins not toothed or finely toothed; flowers small, greenish-white, borne in rounded or flat-topped clusters in the leaf-axils; fruits flat, roundish, winged all around, about 1/3 to 3/4 inch in diameter, including the wing.

As is characteristic of the orange family, the leaves are covered with small transparent dots which may be seen when held up to the sunlight. The plants, when bruised, have a strong odor resembling hops and the fruits have been used in brewing as a substitute for hops.[34]

Occurrence.—GRAND CANYON, 3,000 to 8,000 feet. North Rim: near Bright Angel Point. South Rim: near Yaki Point. Canyon, common on both sides of the Colorado River: Hermit trail, 1/4 mile below Santa Maria Springs; Bright Angel trail about 1/2 mile below South Rim; Indian Gardens; Kaibab trail above Cottonwood Camp; near Roaring Springs.

SUMAC FAMILY (Anacardiaceae)

FIELD GUIDE TO THE GENERA

Leaf-blades thinnish; flower clusters borne in axils of leaves, the slender stems drooping; fruits whitish, globose, smooth, marked with dark green or black veins ..... TOXICODENDRON, p. 153.

Leaf-blades thickish, or somewhat leathery; flower clusters terminal, stiffly erect; fruits red, hairy ..... RHUS, p. 154.

POISON IVY, POISON OAK (*Toxicodendron* (Tourn.) Mill.)

Poison oak and poison ivy are widely distributed in the United States, poison oak in the far west and poison ivy east of the Great Western Divide. Many botanists have considered them as belonging in the genus *Rhus*, but we are following here the recommendation of the committee on horticultural nomenclature[35] in recognizing the separate genus.

The name toxicodendron, is from the Greek meaning poison tree. The word *toxicon*, Greek for bow (referring to the bow and arrow), has come to mean poison because arrow poisons were among the first poisons used by man. The plants contain an oil which, when it comes in contact with the skin, is poisonous to many people, causing severe inflamation and swelling. Many remedies have been recommended, including external applications of solutions of ferric chloride, potassium permanganate, or baking soda, but none of these do more than offer temporary relief after the rash has appeared. It sometimes helps to apply a thin film of laundry soap or a strong solution of baking soda to the hands and face before going into the field and then to wash thoroughly with strong soap after returning home. If one is very susceptible to the poison, clothes which have come in contact with the herbage should be immediately laundered because they may hold the oil for some time and may even affect persons who have not been outside.

Poison oak and poison ivy are not common in the national parks because they usually grow at elevations below that included in most of the park areas.

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34 McMinn, H. E., Illustrated Manual of California Shrubs, p. 260. 1939.

35 American Joint Committee on Horticultural Nomenclature, Standardized Plant Names. Second Edition. 1942.

They are commonly found on moist wooded slopes, along streams, or in chaparral. The bushes are very persistent, sprouting again and again after being cut off from the base. The herbage is not poisonous to livestock and furnishes good browse for deer. Birds and small mammals eat the berries. The flowers furnish honey for bees. The foliage takes on a beautiful red Autumn coloring.

FIELD GUIDE TO THE SPECIES

Leaflets mostly blunt-pointed or rounded at the tip; irregularly toothed; occurs on Pacific Slope ..... 1. *T. diversilobum.*

Leaflets mostly sharper-pointed, the teeth usually fewer, occurs in Southwest and Rocky Mountains ..... 2. *T. radicans.*

1. PACIFIC POISON OAK (*Toxicodendron diversilobum* (T. & G.) Greene).—Erect shrub 3 to 8 feet high, or sometimes a climbing vine with stems up to 30 feet long; leaves divided into 3 leaflets; leaflets roundish to oblong, irregularly and coarsely toothed or lobed, mostly rounded at the tips, 2/3 to 3 inches long, shiny dark green above, paler below; flowers small, greenish, delicate, borne in loose drooping clusters in the axils of the leaves; fruits small, roundish, white with thin dark lines running lengthwise. (Syn. *Rhus diversiloba* T. & G.).

Occurrence.—YOSEMITE, 2,200 to 4,500 feet: El Portal; lower Yosemite Valley; Hetch Hetchy; Rancheria Mountain. SEQUOIA, 2,000 to 4,000 feet: trail to Ash Mountain lookout; Clough Cave; Cedar Cave.

2. WESTERN POISON IVY (*Toxicodendron radicans* Kuntze var. *Rydbergi* (Small) Rehd.).—Usually a low shrub 1 to 3 feet high with dark yellowish-green foliage; leaflets 3 (rarely 5), 1 to 4 inches long, egg-shaped with pointed tips, the margins coarsely toothed or lobed, or sometimes not toothed; flowers greenish-yellow, delicate, borne in loose drooping clusters in the leaf-axils; fruits small, roundish, white with fine green veins running lengthwise. (Syns. *Rhus radicans* L. var. *Rydbergi* (Small) Rehd., *R. toxicodendron* L. var. *Rydbergi* Garrett.)

Occurrence.—YELLOWSTONE, rare: Gardiner River north of Mammoth. ROCKY MOUNTAIN, rare. MESA VERDE. ZION, occasional in moist places, about 4,000 to 4,500 feet: near south entrance; the Narrows trail at Zion Stadium; Emerald Pools; Weeping Rock.

SUMAC (*Rhus* L.)

Many of the sumacs are very attractive shrubs. The leaves of smooth sumac and staghorn especially are very attractive in the Fall when they turn a beautiful red color. The foliage of these two species is of little value as a browse, but that of skunkbush sumac is eaten to some extent by deer. Some species have considerable tannin in the bark. The berries are eaten by birds and small mammals and the pioneers discovered that because of their acid properties, they could be used to make a cooling drink by soaking them in water and adding sugar. For this reason *R. trilobata* is sometimes called lemonade sumac.

The Indians made considerable use of the sumacs wherever they were

found. They used the stems to furnish a mordant in dye-making. The long slender reddish shoots of *R. trilobata* were gathered by the women for basket-making. Hence this species is sometmies called squawbush. The leaves of smooth sumac were mixed with tobacco for smoking.

FIELD GUIDE TO THE SPECIES

Leaves 3-lobed or divided into 3 leaflets, about 1 inch long ..... 1. *R. trilobata.*
Leaves divided into 5 to 10 pairs of leaflets, the leaflets 2 to 4 inches long.
Branchlets smooth, with a whitish bloom; flower clusters finely hairy; fruits sticky-hairy ..... 2. *R. glabra.*
Branchlets, flower clusters, and fruits densely hairy ..... 3. *R. typhina.*

1. SKUNKBUSH SUMAC (*Rhus trilobata* Nutt.), fig. 88.—Spreading shrub 1 to 5 feet high, the herbage with a disagreeable odor when crushed; leaves thickish, dark green above, paler below, mostly divided into 3 leaflets; leaflets oval or reverse-egg-shaped to wedge-shaped, 1/3 to 1 1/3 inches long, the middle leaflet usually longer than the lateral leaflets, few-toothed with coarse rounded teeth; flowers yellow, small, borne close together in stiff clusters at the ends of the stems before the leaves appear; fruits bright orange-red, about 1/4 inch in diameter, somewhat flattened, sticky-hairy. (Syn. *Rhus utahensis* Goodd.).

Fig. 88. Skunkbush sumac (*Rhus trilobata*).

Occurrence.—YOSEMITE, occasional, up to 4,000 feet; Yosemite Valley; Mirror Lake; Tenaya Canyon. SEQUOIA: Cedar Creek; North Fork Kaweah River. YELLOWSTONE, common: Boiling River; Gardiner River; Mammoth; Red Mountain; Whiskey Gap; near Table Mountain. ROCKY MOUNTAIN, rare. MESA VERDE, occasional in the canyons: trail to Balcony House; Wickiup Canyon. BRYCE CANYON, occasional, 6,000 to 7,000 feet. ZION, occasional: lower walls of Zion Canyon near west entrance; near entrance to Zion Cafeteria. GRAND CANYON, common in the canyon, 3,500 to 6,000 feet: Hermit trail; Bright Angel trail; Indian Gardens; Kaibab trail; Cedar Ridge; near Roaring Springs.

2. SMOOTH SUMAC (*Rhus glabra* L.).—Erect shrub 3 to 6 feet high with smooth often reddish branches; leaves 6 to 8 inches long, divided into 5 to 10 pairs of leaflets; leaflets 2 to 4 inches long, narrowly oblong with pointed tips, the margins mostly toothed; flowers greenish or yellowish, borne in dense narrowly pyramid-shaped clusters 3 to 4 inches long; fruits small, rounded, bright red, sticky-hairy, the fruiting clusters standing up like fiery pokers at the ends of the stems. (Syn. *Rhus cismontana* Greene.)

Occurrence.—ZION, rare in Zion Canyon: near Weeping Rock; Court of the

Patriarchs; Emerald Pools. GRAND CANYON, occasional along streams in the canyon, 3,000 to 4,000 feet: along Bright Angel Creek about 2 miles above Phantom Ranch; on the Tonto. ISLE ROYALE, occasional: Lake Richie; trail to Forbes Lake; Mount Franklin trail; near Sargent Lake; South of McCargo Cove.

3. STAGHORN SUMAC (*Rhus typhina* L.).—Similar to smooth sumac except generally larger, sometimes a small tree up to 20 or 30 feet high; branches velvety; leaflets 11 to 31, dark green above; pale below; flower clusters and fruits densely velvety-hairy.

Occurrence.—ISLE ROYALE, occasional: Greenstone Ridge.

STAFF-TREE FAMILY (Celastraceae)

FIELD GUIDE TO THE GENERA

Petals 5, white, soon falling; branches spine-tipped; plants deciduous; found only in Grand Canyon National Park ..... FORSELLESIA, p. 156.

Petals 4, greenish or reddish; branches not spine-tipped; plant evergreen; found in all except California parks ..... PACHISTIMA, p. 156.

SPINY GREASEBUSH (*Forsellesia spinescens* (Gray) Greene).—Much-branched shrub 1 to 4 feet high with slender, green, spine-tipped branches; leaves small, 1/3 inch long or less, oblong, pointed at the tip and tapering to the base; flowers small, borne singly on slender stems in the leaf-axils; petals 5, white, narrow, soon falling; fruits tiny pods, splitting down one side to release 1 to 2 shiny brown seeds. (Syn. *Glossopetalon spinescens* Gray.)

Occurrence.—GRAND CANYON, common in the canyon on both sides of the Colorado River, 4,500 to 6,500 feet: Berry trail, ½ mile down; Bright Angel trail about 1½ miles above Indian Gardens; Cedar Ridge near fossil fern quarry; Kaibab Trail above Roaring Springs junction.

Fig. 89. Myrtle pachistima (*Pachistima myrsinites*).

MYRTLE PACHISTIMA, MOUNTAIN LOVER (*Pachistima myrsinites* (Pursh) Raf.), fig. 89.—Low, densely branched evergreen shrub, ½ to 3 feet high, the leaves opposite each other on the stems; leaves small, thickish, ½ to 1½ inches long, elliptic to oblong, the margins finely toothed, tapering to the base; flowers tiny, 1 to 3 on short stalks in the leaf-axils; petals 4, brick-red or greenish; fruits oblong pods, about ¼ inch long, 1- or 2-seeded.

This is a common undercover shrub in moist open woods in many of the western parks. The plant is sometimes called boxleaf or boxwood because of its resemblance to the cultivated "box" which is used for hedges. The foliage is browsed to

some extent by deer, elk, and mountain sheep, particularly when other food is scarce. The leaves are rather tough to be very palatable.

Occurrence.—OLYMPIC, common, 1,000 to 5,000 feet: Lake Crescent; Seven Lakes Basin; ridge south of Sentinel Peak, near Hayden Pass; Marmot Lake; Mount Angeles. MOUNT RAINIER, common, 3,000 to 4,000 feet: head of Stevens Canyon; Stevens Canyon burn; Shriner Peak; Crystal Peak. CRATER LAKE: southwest corner of park, 5,300 feet; lower Redblanket Creek; Castle Creek at west entrance. GLACIER, common, 3,200 to 6,000 feet: Belton; North Fork Flathead River road; trail to Avalanche Lake; trail to Granite Park; east entrance; Going to the Sun Chalets; switchbacks on east side of Swiftcurrent Pass; St. Mary Lake; Red Eagle Valley Two Medicine Valley Cut Bank Valley. YELLOWSTONE. GRAND TETON, common: South Fork Cascade Canyon. ROCKY MOUNTAIN, abundant at higher elevations on the west slope. MESA VERDE: trail to Balcony House. BRYCE CANYON, rare along Rim Drive: Rainbow Point; Natural Bridge. ZION, in the forests on the plateaus, 6,000 to 7,000 feet: West Rim trail, above ranger cabin. GRAND CANYON, on the North Rim, rare: Powell Saddle; north end of Walhalla Plateau.

BLADDERNUT FAMILY

(Staphyleaceae)

SIERRA BLADDERNUT (*Staphylea Bolanderi* Gray), fig. 90.—Erect shrub 3 to 10 feet high; leaves divided into 3 leaflets, the leaflets egg-shaped to roundish with pointed tips, 1 to 2½ inches long, smooth on both sides, the margins finely toothed; flowers white, borne in drooping few-flowered clusters at the ends of the branches; fruit a bladder-like capsule, 1 to 2 inches long, 3-celled, the cells 1- to 4-seeded. This shrub is sometimes called California balloon bush because of the inflated capsules.

Fig. 90. Sierra bladdernut (*Staphylea Bolanderi*).

Occurrence.—YOSEMITE: near El Portal, 2,500 feet. SEQUOIA, about 2,500 to 4,500 feet: Paradise Creek; Cedar Creek, North Fork Kaweah River; West of Panorama Point; between Clough Cave and Garfield Grove of bigtrees.

MAPLE FAMILY (Aceraceae)

MAPLE (*Acer* L.)

Maples are widely distributed and common trees or shrubs in the United States, one or more species being found in each of our western national parks. They are easily recognized by the palmately lobed or divided leaves and the characteristic fruits borne in winged pairs. Most of the species furnish valuable food for animals, even during the winter when the leafless twigs may be browsed.

FIELD GUIDE TO THE SPECIES

Leaves lobed (occasionally divided into 3 leaflets in *A. glabrum*).
- Flowers in loose spreading clusters; western species.
  - Leaves 7- or 9-lobed, green on both sides ..... 1. *A. circinatum.*
  - Leaves 3- or 5-lobed, green above, paler below.
    - Lobes of leaves not toothed or with a few coarse teeth; petals none; found in the Southwest ..... 2. *A. grandidentatum.*
    - Lobes of leaves toothed; petals present; widespread and variable species ..... 3. *A. glabrum.*
- Flowers in narrow elongate clusters 3 to 6 inches long; eastern species found on Isle Royale.
  - Leaves 3-lobed about middle; flower-clusters erect or spreading; petals narrowly spatula-shaped shrubs ..... 4. *A. spicatum.*
  - Leaves 3-lobed at tip; flower-clusters drooping; petals reverse-egg-shaped; mostly trees ..... 5. *A. pennsylvanicum.*

Leaves divided into 3 to 5 leaflets; mostly trees; found in the Southwest ..... 6. *A. negundo* var.

1. VINE MAPLE (*Acer circinatum* Dougl.).—Usually widely spreading shrubs or small trees with slender, often reclining stems sometimes taking root where they touch the ground; bark smooth, grayish-brown, tinged with red; leaves 7- or 9-lobed, 2 to 4½ inches across, smooth on both sides, or softly hairy below when young, bright green, turning reddish-yellow or bright scarlet in the Fall; flowers small, with dark purplish-red sepals and tiny white petals, borne on slender stems in loose spreading clusters; fruits smooth, often reddish, with wings spreading opposite each other in a straight line; generally found as an understory shrub in evergreen forests of the Northwest.

Occurrence. — OLYMPIC, abundant, from lowest elevations to about 3,000 feet: Lake Crescent; Elkhorn Guard Station, Elwha River; Olympus Guard Station, Hoh River; Duckabush River. MOUNT RAINIER, common, 1,700 to 4,500 feet: Longmire-Paradise road; Ramparts Ridge trail; Sunset Park road.

Fig. 91. Bigtooth maple (*Acer grandidentatum*).

2. BIGTOOTH MAPLE (*Acer grandidentatum* Nutt.), fig. 91.—Usually a shrub 6 to 15 feet high, or sometimes a small tree up to 40 or 50 feet high with light brown twigs and gray branches; leaves 2 to 5 inches across, roundish in outline, dark green above, pale and more or less hairy below, deeply divided into 3 lobes, the notches rounded between, the lobes coarsely few-toothed; flowers borne in spreading clusters, the flower-stems softly hairy; fruits smooth, the wings more or less parallel. The foliage

of bigtooth maple shows considerable resemblance to that of sugar maple of the eastern states and it is interesting to note that it has been reported that sugar has been obtained from the sap of this western species also.

Occurrence.—MESA VERDE. ZION, common along streams and in moist places, 4,250 to 6,000 feet: East Rim trail above Weeping Rock; Birch Creek trail near junction of trail to Lady Mountain; Narrows trail. GRAND CANYON, 5,000 to 7,500 feet. North Rim, common just below the rim. South Rim, rare below the rim. Canyon, occasional in moist places, especially on the north side of the Colorado River: Kaibab trail above Roaring Springs junction; Roaring Springs.

3. ROCKY MOUNTAIN MAPLE (*Acer glabrum* Torr.), fig. 92.—Slender-stemmed shrub 4 to 12 feet high, or a small tree with smooth reddish-brown trunk and narrow crown of straight slender branches pointing upwards; leaves 1 to 3 inches across, smooth on both sides, deeply 3- to 5-lobed with V-shaped notches, or sometimes divided into 3 leaflets, the margins unevenly toothed; flowers greenish-yellow, borne in loose drooping clusters; wings of fruits spreading obliquely, forming more or less right angles or sometimes nearly parallel, often reddish; found commonly in moist locations along streams, in canyons, and on shaded flats as undercover in the forests. In certain areas the leaves are conspicuous because of brilliant red spots due to insect galls.

Several varieties of Rocky Mountain maple have been described, the variety *Douglasi* being the one most commonly recognized. The leaves are generally 3-lobed and the fruits somewhat stouter with more or less parallel wings. Because of the difficulties in distinguishing between the varieties, no segregation is made in the parks listed here.

Occurrence.—OLYMPIC: Elwha River at junction of Godkin Creek; Crystal Creek; Mount Angeles. MOUNT RAINIER, occasional, 2,000 feet: Longmire; Sunset Park road. CRATER LAKE: trail to boat landing; Round Top; Wine-glass; Whitehorse Bluff. LAS-

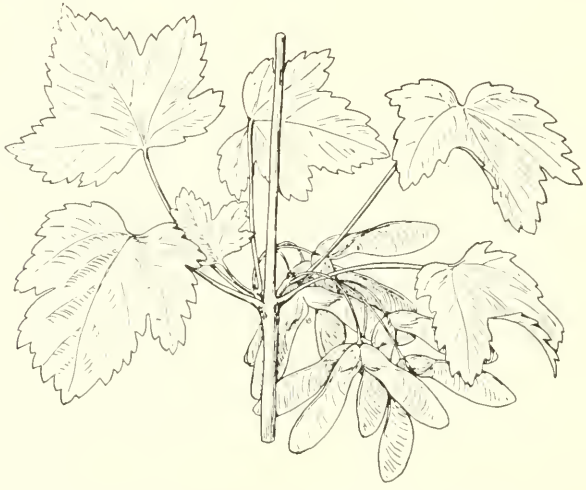

Fig. 92. Rocky Mountain maple (*Acer glabrum*).

SEN. YOSEMITE, occasional, 5,000 to 10,000 feet: trails leading out of Yosemite Valley; Glacier Point; Clark's Point. KINGS CANYON: Junction Meadows. SEQUOIA, 6,000 feet: Atwell Mill; Whitney Creek; near Mineral King; near Wolverton Creek. GLACIER, abundant, 3,100 to 7,800 feet: Lake McDonald Hotel; Avalanche campgrounds; Going-to-the-Sun Chalet; Swiftcurrent Lake and valley; Iceberg Lake trail; Crossley Lake. YELLOWSTONE: Mammoth Hot Springs; mouth of Lost Creek; near east entrance. GRAND TETON, occasional, 6,700 to 8,000 feet: Granite Canyon. ROCKY MOUNTAIN, 8,000 to 9,000 feet. MESA VERDE, rare: west of Prater Canyon ranch house, 7,500 feet. BRYCE CANYON. ZION: moist places on the plateau, about 6,000 feet. GRAND CANYON, 7,000 to 8,000 feet. North Rim, occasional just below rim: near top of Kaibab trail; McKinnon Point. South Rim, rare. Canyon, occasional on the north side of the river: Kaibab trail below North Rim.

4. MOUNTAIN MAPLE (*Acer spicatum* Lam.), fig. 93.—Shrub or small tree up to about 25 feet high; leaves mostly 3-lobed, sometimes slightly 5-lobed, 2½ to 5 inches long, smooth above, hairy below, light green, turning orange or scarlet in the Fall; flowers greenish-yellow, borne in narrow erect spikes 3 to 5½ inches long; fruits at first hairy, becoming smooth at maturity, wings spreading at an acute or nearly right angle, sometimes bright red.

Fig. 93. Mountain maple (*Acer spicatum*).

Occurrence. — ISLE ROYALE, common: near Lake Desor; Mott Island at northeast tip of island.

5. STRIPED MAPLE (*Acer pennsylvanicum* L.).—Usually a small tree up to 30 or 35 feet high, with smooth green branchlets becoming striped with white lines; leaves 3-lobed near tips, 5 to 7 inches long, bright green, rusty-hairy below when young, turning yellow in the Fall; flowers small, yellow, borne in slender elongate pendulous clusters 4 to 6 inches long; wings of fruits widely spreading.

Occurrence.—ISLE ROYALE, rare.

6. INLAND BOXELDER (*Acer negundo* L. var. *interius* (Britt.) Sarg.).—Usually a tree 20 to 50 feet high, or sometimes a tall spreading shrub; bark grayish-brown, rough in age; leaves divided into 3 or sometimes 5 leaflets; leaflets oblong, pointed at the tips, 2 to 5 inches long, the margins irregularly toothed; flowers yellowish-green, appearing before the leaves; wings of fruits spreading obliquely.

Occurrence.—MESA VERDE: west of ranch house in Prater Canyon, 7,500 feet.

ZION, common along streams in the canyons, 4,000 to 4,500 feet: along Virgin River; near Zion Lodge; the Narrows trail. GRAND CANYON, 3,000 to 8,000 feet. North Rim, occasional: Cliff Spring. Canyon: Bright Angel Canyon; Kaibab trail about 2 miles above Phantom Ranch; Roaring Springs; Kaibab trail above Roaring Springs.

MALPIGHIA FAMILY (Malpighiaceae)

SLENDER JANUSIA (*Janusia gracilis* Gray).—A low bushy shrub about 8 inches to 1½ feet high or woody below and with slender straggling, vine-like or twining stems; leaves opposite, narrowly lance-shaped, ⅜ to 1¼ inches long, thinly hairy on both sides; flowers small, about ⅜ inch across; petals small, 5, yellow, turning reddish-brown; fruit composed of 2 or 3 winged seed-like structures about ⅜ to ½ inch long.

Occurrence.—GRAND CANYON, collected in the canyon north of the Colorado River: Clear Creek trail on the rocky slopes above Bright Angel Creek; Kaibab trail for several miles up Bright Angel canyon.

BUCKTHORN FAMILY (Rhamnaceae)

FIELD GUIDE TO THE GENERA

Leaves few, small, ½ inch long or less; stems spiny, soon becoming naked; fruits berry-like with one seed; occurs in parks of the Southwest ....CONDALIA, p. 161.

Leaves usually many, covering the stems, mostly more than ½ inch long; stems not spiny or some spiny; many species widespread in the parks.

Flowers inconspicuous, greenish; fruits berry-like, black, 2- to 4-seeded .....RHAMNUS, p. 161.

Flowers showy, white, blue or purplish; fruits capsules, 3-celled, 3-seeded, mostly becoming brownish .....CEANOTHUS, p. 165.

SOUTHWESTERN CONDALIA (*Condalia lycioides* Weber.).—A rigidly-branched shrub with spinose stems, 4 to 6 feet high, the branchlets and spines whitish and minutely hairy; leaves narrow-elliptic, about ½ inch long, very short-stalked; flowers tiny, with or without petals, borne in few-flowered clusters in the leaf-axils; fruit berry-like, globose, about 1/3 inch in diameter, bluish to black. (Syn. *Zizyphus lycioides* Gray.)

This is a desert shrub with straggling very rigid spine-tipped branches. The stems are naked for a considerable part of the year, as the leaves soon fall. The shrub has little value as a browse, but the fruits are eaten by birds.

Occurrence.—GRAND CANYON: Great Thumb; Shinumo.

BUCKTHORN, COFFEEBERRY (*Rhamnus* L.)

The buckthorns are closely related to some of the species of *Ceanothus* but are easily distinguished by their inconspicuous greenish flowers and the dark brown or red berry-like fruits. The berries contain 2 to 4 hard seeds similar to coffee beans, hence the common name, coffeeberry. The Pacific coast species, cascara sagrada and California buckthorn, are used medicinally as the source of a common laxative. The bark of cascara sagrada, particularly, is collected for this purpose in considerable quantities in Washington and Oregon. The foliage is browsed to some extent by deer and the berries are eaten by birds and small mammals.

FIELD GUIDE TO THE SPECIES

Leaves deciduous; shrubs found in parks other than in Sierra Nevada.
- Leaves mostly 3 to 5 inches long; occurs in parks of the Northwest ..... 1. *R. Purshiana.*
- Leaves mostly less than 3 inches long; shrubs found east of Great Western Divide.
  - Winter buds enclosed by small bud scales; flowers usually 2 to 5 in the leaf-axils; found in northern parks ..... 2. *R. alnifolia.*
  - Winter buds without bud scales; flowers usually in clusters of 5 to 12; found in the Southwest ..... 3. *R. betulaefolia.*

Leaves evergreen; shrubs of the Sierra Nevada parks.
- Leaves mostly more than 1 inch long, the margins not spine-toothed; berries black when ripe.
  - Stems red; leaves thinnish, 3/4 to 1 1/2 inches long, mostly rounded at the tips ..... 4. *R. rubra.*
  - Stems grayish or brownish; leaves thickish, 2 to 3 inches long, mostly pointed at the tips ..... 5. *R. tomentella.*
- Leaves mostly less than 1 inch long, the margins spinose-toothed and holly-like; berries red ..... 6. *R. crocea* var. *ilicifolia.*

1. CASCARA SAGRADA BUCKTHORN (*Rhamnus Purshiana* DC.).—Shrub or small tree 8 to 20 feet high with leaves in bunches at the ends of the branchlets; bark gray; leaves elliptic-oblong, 2 1/2 to 5 (or 8) inches long, thinnish, blunt-pointed at the tip, the margins usually finely and rather irregularly toothed; flowers small, greenish, borne on slender stems in small clusters in the leaf-axils; berries black, about 1/4 to 1/3 inch in diameter, usually 3-seeded. The plants favor moist shaded places in the forests. The common name, cascara sagrada, meaning sacred bark, is derived from the fact that the bark is commonly used medicinally. The berries are eaten by certain birds and small mammals and the foliage is of some importance as a browse for mule deer.

Occurrence.—OLYMPIC, 400 to 2,000 feet: Lake Crescent; Lake Quinault; Enchanted Valley. MOUNT RAINIER, rare. CRATER LAKE, occasional, 4,500 to 6,500 feet: Annie Creek at south entrance; near park headquarters; Castle Crest; Pole Bridge; south of Whitehorse Bluff; lower Red Blanket Creek.

2. ALDER BUCKTHORN (*Rhamnus alnifolia* L' Her.), fig. 94.—Small shrub 2 to 6 feet high; leaves elliptic, 1 to 3 1/2 inches long, more or less pointed at both ends, thin, smooth, prominently veined, the margins toothed; flowers greenish, inconspicuous, borne singly or 2 to 5 on slender stems in the leaf axils; berries black, 1/4 to 1/3 inch in diameter, 3-seeded, the nutlets flattened on one side; occurs along streams and in wet places.

Occurrence.—GLACIER, occasional, 4,300 feet to timberline: Avalanche Lake; Swiftcurrent Lake and Valley; Kintla Lake; Waterton ranger station; Crossley Lake; Two Medicine valley; Red Eagle Lake; St. Mary Lake and Valley. YELLOWSTONE: Obsidian Creek. GRAND TETON: Jackson Lake. ISLE ROYALE, occasional at edges of bogs: near Lake Desor; Washington River.

3. BIRCH BUCKTHORN (*Rhamnus betulaefolia* (Greene) var. *obovata* Kearney & Peebles).—Spreading shrubs 3 to 6 feet high, the young branches

Fig. 94. Alder buckthorn (*Rhamnus alnifolia*).

often reddish; similar to alderleaf buckthorn except that bud scales are lacking and the flowers usually about 5 to 12 in a cluster; occurs in moist places in parks of the Southwest.

Occurrence.—GRAND CANYON, in the Canyon, 4,500 to 7,500 feet: Bright Angel Trail; Kaibab trail; Hermit Creek; Roaring Springs; Bright Angel Canyon.

4. REDSTEM BUCKTHORN, SIERRA BUCKTHORN (*Rhamnus rubra* Greene var. *obtusissima* Jepson).—Shrub 2 to 5 feet high, with reddish twigs; leaves elliptic to oblong, rounded at the tips, ¾ to 1½ inches long, thinnish, with prominent veins, not hairy except sometimes along the midribs and veins below, the margins finely toothed; flowers small, greenish, borne in small clusters in the leaf-axils; berries roundish, more or less constricted towards the base, ¼ inch long or less, becoming black.

Occurrence.—YOSEMITE, 4,000 to 5,500 feet: Yosemite Valley; Hetch Hetchy. SEQUOIA, west wall of Kern Canyon at Chagoopa Falls, 6,500 feet. LASSEN.

4a. YOSEMITE COFFEEBERRY (Var. *yosemitana* (Wolf) McMinn).—

Differs from the above variety in having leaves softly hairy on both sides.

Occurrence.—YOSEMITE, about 4,000 feet: Hetch Hetchy; Yosemite Valley; Wawona. KINGS CANYON: Kings River Canyon; near Charlotte Creek. SEQUOIA: vicinity of Mineral King.

Fig. 95. Whiteleaf buckthorn (*Rhamnus tomentella*).

5. WHITELEAF BUCKTHORN (*Rhamnus tomentella* Benth.), fig. 95.—Robust evergreen shrub 4 to 6 (or 10) feet high with gray or brown branches and leaves scattered along the branchlets in contrast to those of cascara buckthorn which are clustered towards the ends of the branchlets; leaves thickish, narrowly elliptic to oblong or lance-shaped, 2 to 3 inches long, abruptly pointed at the tips, the margins finely toothed or not toothed, prominently veined and densely hairy below with fine grayish or yellowish hairs; flowers small, greenish, borne in small clusters in the leaf-axils; berries 1/4 to 1/3 inch in diameter, round or oval, becoming reddish and then black, usually containing 2 nutlets. (Syn. *R. californica* Eschsch. var. *tomentella* Brew. & Wats.).

The species is found usually in rocky soil on warm dry slopes, often growing to large shrubs with dense rounded crowns, especially in openings in the chaparral.

Occurrence.—YOSEMITE, 2,000 to 4,000 feet: Merced Falls. KINGS CANYON: General Grant Grove. SEQUOIA, 4,500 feet: Marble Fork Kaweah River; Clough Cave; west of Ash Mountain just outside park boundary.

6. HOLLYLEAF REDBERRY BUCKTHORN (*Rhamnus crocea* Nutt. var. *ilicifolia* (Kell.) Greene).—Branched evergreen shrub 3 to 12 feet high with short stout often spine-tipped branches, or sometimes tree-like; leaves elliptic to roundish, 1/3 to 1 inch long, stiff and leathery, holly-like, with spine-toothed margins, smooth above, yellowish-green below; flowers 1 to few in the leaf-axils, without petals; berries oval, about 1/4 inch long, bright red when ripe, usually with 2 seeds.

Occurrence.—YOSEMITE, rare, 6,000 feet: near El Portal; Yosemite Valley; foot of Yosemite Falls; north side of Muir Gorge; Hetch Hetchy Valley. SEQUOIA, occasional, 2,500 to 4,200 feet: Colony Mill trail; highway between Ash Mountain and Advance Camp; east of Hospital Rock; 3 miles west of Hidden Springs ranger station; 1/2 mile east of Clough Cave.

CEANOTHUS (*Ceanothus* L.)

Ceanothus is common in the western national parks, particularly in the Sierra Nevada parks of California and in the Southwest. It occurs commonly on open slopes or in openings in the forest and most of the species are quick to come into burned areas. The small flowers, mostly blue or white, are borne in showy clusters. They are quite distinctive, with tiny scoop-like petals spreading from between incurved sepals, all parts colored alike. The fruits are small globose 3-lobed capsules, often sticky, at least when young.

Various common names have been applied to the different species; mountain lilac because of the showy clusters of sweet-smelling flowers; hornbrush, referring particularly to the thick-leaved species with horned fruits; buckbrush because it is browsed by deer; and soapbloom because of a soapy substance contained in the flowers. A very good soapy lather may be obtained by rubbing the blossoms between the hands with a small amount of water. In this manner the flowers of many of the species, particularly chaparral whitethorn ceanothus, were used by the Indians. The herbage, especially of the thin-leaved species furnish valuable browse for deer.

FIELD GUIDE TO THE SPECIES

Leaves alternate, mostly with 3 main veins from the base (except *C. diversifolius*); capsules not horned, sometimes crested.

Branchlets more or less spine-tipped; herbage grayish.

Tall shrubs 5 to 15 feet high; flowers white or blue; capsules not ridged, somewhat sticky ..... 1. *C. leucodermis.*

Low shrubs 1/3 to 4 feet high; flowers white; capsules with narrow ridge down the back of each lobe.

Shrubs found in Sierra Nevada parks of California ..... 2. *C. cordulatus.*

Shrubs found in southern Rocky Mountains and Southwest ..... 3. *C. Fendleri.*

Branchlets not spine-tipped.

Leaves 1 inch or less long.

Prostrate or trailing shrubs 1 foot high or less; leaves with 1 main vein; found in Sierra Nevada parks ..... 4. *C. diversifolius.*

Erect or spreading shrubs 2 to 3 (or 6) feet high; leaves with 3 main veins.

Rigidly branched shrubs found in the Southwest; flowers white ..... 5. *C. Martini.*

Shrubs with slender flexible branches, found in Sierra Nevada parks; flowers blue ..... 6. *C. parvifolius.*

Leaves 2/3 to 4 inches long.

Leaves thinnish, dull green above, deciduous; fruits not sticky.

Leaf-margins not toothed; flowers white or pale blue or pink; found in California parks ..... 7. *C. integerrimus.*

Leaf-margins finely toothed; flowers white, not in California parks.

Leaves green above, not hairy.

Leaves roundish to egg-shaped, mostly blunt-pointed; flower-clusters short-stalked, borne on lateral branches of previous season; northwestern species ..... 8. *C. sanguineus.*

Leaves egg-shaped to oblong-egg-shaped, pointed or tapering at tips; flower-clusters slender-stalked, borne at ends of branches of the season; eastern species .....9. *C. americanus.*

Leaves grayish and dingy-looking with fine gray hairs .....10. *C. molissimus.*

Leaves thickish, shiny above as if varnished; evergreen; foliage often with a strong cinnamon-like odor; fruits sticky .....11. *C. velutinus.*

Leaves opposite, thickish, with 1 main vein; capsules with a horn at or near top of each lobe.

Generally low, spreading, or prostrate shrubs; flowers blue (sometimes white in *C. pinetorum*).

Leaves 1/6 to 1/2 inch long, squared at tips and more or less toothed; fruits with slender horns on sides near top .....12. *C. fresnensis.*

Leaves 1/3 to 1 inch long, with stiff sharp-pointed teeth; fruits with stout horn at top of each lobe.

Leaves mostly 3-toothed at tip; found in Crater Lake, Lassen, and Yosemite National Parks .....13. *C. prostratus.*

Leaves mostly several-toothed along the sides; found in Sequoia National Park .....14. *C. pinetorum.*

Erect shrubs 2 to 12 feet high; leaves not toothed or only slightly so; flowers white.

Plants 4 to 12 feet high; horns of fruits attached at or near top; found in Sierra Nevada parks .....15. *C. cuneatus.*

Plants 2 to 4 feet high; horns of fruits attached laterally; found in Southwest .....16. *C. vestitus.*

1. CHAPARRAL WHITETHORN CEANOTHUS (*Ceanothus leucodermis* Greene).—Large shrub 5 to 16 feet high, often forming dense thickets; branchlets whitish, rigid, some of them spine-tipped; leaves 1/4 to 1 1/4 inches long, oval, rounded at base, somewhat pointed at tips, thickish, smooth and green above, paler below, with 3 main veins, the margins finely toothed or not toothed; flowers blue or white, borne in narrow, usually unbranched clusters 1 to 2 inches long; capsules nearly round, about 1/4 inch in diameter, smooth but rather sticky. The seeds sprout readily after fire, hence it is one of the first species to come into burned areas. (Syn. *C. divaricatus* Auth., not Nutt.)

Occurrence.—YOSEMITE, rare, 3,000 to 6,000 feet: Yosemite Valley, near post office; near El Portal; Wawona. SEQUOIA, occasional, 3,500 to 6,500 feet: Switchback Peak; head of Burnt Camp Creek; Cedar Creek, North Fork Kaweah; Clough Cave.

2. MOUNTAIN WHITETHORN CEANOTHUS (*Ceanothus cordulatus* Kell.).—Low, round-topped, much-branched, spreading shrub 1 to 4 feet high with crooked, rigid, spine-tipped branches and whitish bark; leaves smooth or very finely hairy, thickish, elliptic to roundish, 1/2 to 1 inch long, with 3 veins from the base, the margins usually not toothed; flowers white, with a sickening-sweet odor, borne in small dense clusters 1/2 to 1 1/2 inches long; fruits about 1/6 inch in diameter, 3-lobed, with a narrow ridge down the back of each lobe. The bushes sometimes form dense covers over extensive areas on openly forested mountain slopes or flats, particularly in ponderosa pine and white fir stands of California and southwestern Oregon.

Occurrence.—LASSEN: Hot Springs Valley; Warner Valley; Kings Creek along trail to Twin Lakes. YOSEMITE, common, 4,000 to 8,500 feet: junction of Clark and Gray Creeks; Mirror Lake; Sunrise trail; Mariposa Grove of bigtrees; Glacier Point; Sentinel Dome; Little Yosemite; Merced Lake trail; Tuolumne Grove of bigtrees. KINGS CANYON, common: near Sphinx Creek. SEQUOIA, abundant, 6,300 to 8,500 feet: south of Redwood Meadows; Round Meadow, Giant Forest; Garfield Grove of bigtrees; Trout Meadow; west of Little Baldy; lower Bearpaw Meadow.

3. FENDLER CEANOTHUS (*Ceanothus Fendleri* Gray).—Dwarf shrub 1/3 to 3 feet high with some of the branchlets spine-tipped; leaves alternate, oblong to elliptic, green and somewhat hairy above, grayish and often silky-hairy below, 1/3 to 1 1/3 inches long, with 3 prominent veins and nearly untoothed margins; flowers white, borne in small unbranched clusters at the ends of the branchlets; fruits nearly round, 3-lobed, about 1/5 inch in diameter.

Because of its wide distribution and abundance, this species is one of the most important browse plants in the Southwest.[36]

Occurrence.—ROCKY MOUNTAIN, rare: Beaver Point. MESA VERDE, present along entrance highway. ZION, on the plateau, 5,500 to 7,000 feet: West Rim trail near Angel's Landing. GRAND CANYON, on the North Rim and just below; Kaibab trail below rim; Bright Angel Point; Greenland Springs.

4. TRAILING CEANOTHUS (*Ceanothus diversifolius* Kell.).—Grayish-green, evergreen, matted-looking shrub with prostrate or trailing stems 2 to 4½ feet long; leaves roundish, ½ to 1 inch long, green above, pale below, softly hairy on both sides, the margins very finely toothed and sometimes wavy; flowers blue or almost white, only a few in small clusters; fruits small, about 1/6 inch in diameter, with 3 small wing-like ridges near the top.

Occurrence.—YOSEMITE, occasional, 3,000 to 6,000 feet: from Hetch Hetchy to Merced Grove; near Wawona; Mariposa Grove; Crane Creek. SEQUOIA, 6,300 feet: head of Burnt Camp Creek.

5. MARTIN CEANOTHUS (*Ceanothus Martini* Jones), fig. 96.—Low, open, rigidly-branched shrub 3 to 6 feet high; branches and twigs grayish, without spines; leaves alternate, 1/3 to 1 inch long, elliptic to oval or almost round, smooth, green on both sides, with 3 prominent veins from the base, minutely toothed or

Fig. 96. Martin ceanothus (*Ceanothus Martini*).

36 Kearney, T. H., & Peebles, R. H., Flowering Plants and Ferns of Arizona, p. 559. 1942.

not toothed; flowers white, in small, usually simple clusters about ½ to 1 1/3 inches long. The species is not common, but it is important as a browse plant wherever found.

Occurrence.—BRYCE CANYON, common on the plateau: near Lodge; Bryce Point; Farview; side road west of Bryce Canyon. ZION, present on plateau. GRAND CANYON, 6,500 to 8,500 feet. North Rim, common: Bright Angel Point; McKinnon Point; Walhalla Plateau along road to Cape Royal; Uncle Jim Point. Canyon, on north side of Colorado River a little below the rim.

6. LITTLELEAF CEANOTHUS (*Ceanothus parvifolius* Trel.).—Low, flat-topped shrub, 2 to 4 feet high, with slender, flexible branchlets; leaves alternate, oblong, smooth, thin, 1/3 to 1 inch long; flowers blue, borne in short clusters ½ to 1 inch long (or sometimes longer) at the ends of slender branches; fruits small, about 1/6 inch in diameter, almost smooth; an excellent browse plant.

Occurrence.—YOSEMITE, rare, 5,000 to 7,000 feet: near Chinquapin; Wawona; Yosemite Valley; Tuolumne Grove; 3 miles south of Gin Flat; Grouse Creek; Mariposa Grove. SEQUOIA, 4,000 to 7,000 feet: 1 mile south of Redwood Meadow ranger station; Kern Canyon; Marble Fork Kaweah River; trail to Alta Meadows.

7. DEERBRUSH CEANOTHUS (*Ceanothus integerrimus* H. & A.).—Loosely branched shrub usually 3 to 12 feet high with long slender branches and yellowish-green bark; leaves alternate, not toothed, thin, oval, 1 to 4 inches long, with 3 conspicuous main veins, green above, paler below; flowers white, pale blue or pinkish, sweet-scented, borne in more or less branched clusters 3 to 6 inches long; fruits small, about ¼ inch in diameter, round, faintly 3-lobed with an oblong swelling on the back of each lobe.

This shrub is very common in the ponderosa pine belt of the Sierra Nevada Mountains of California, extending north into Washington. The stumps sprout after cutting or fire, which helps to account for the abundance of the species. The large thin leaves and tender stems make this one of the most important browse plants for deer, hence the common name, deerbrush.

Occurrence.—CRATER LAKE, rare: lower Red Blanket Canyon. YOSEMITE, common, 2,500 to 6,000 feet: Wawona; Crane Creek; mouth of Indian Canyon; near El Portal; Yosemite Valley; near foot of Yosemite Falls; near Mirror Lake; Hetch Hetchy Valley. KINGS CANYON: near Sphinx Creek. SEQUOIA, common, 2,500 to 6,500 feet: Colony Mill ranger station; Cliff Creek; River Valley; Ash Mountain; Advance Camp highway; near Redwood Meadow; Clough Cave; Cedar Creek, North Fork Kaweah River; South Fork Kaweah River; Lodgepole campground; Buck Canyon.

8. REDSTEM CEANOTHUS (*Ceanothus sanguineus* Pursh).—Tall shrub 3 to 8 (or 9) feet high with slender, flexible, usually reddish branchlets; leaves elliptic to oval, 1½ to 3 inches long, thinnish, smooth and green above, paler and slightly hairy below, with 3 main veins, the margins finely and irregularly toothed; flowers white, borne in branched clusters 2 to 4 inches long in the leaf-axils of the old stems; capsules small, scarcely 1/6 inch in diameter, shallowly 3-lobed.

Occurrence.—OLYMPIC: Elwha River north of Wildrose Creek, 2,500 feet; Mount Angeles. MOUNT RAINIER, rare: upper valley of the Nisqually. GLACIER, rare, 3,200 feet: Belton Hills; Apgar Peak.

9. JERSEY TEA CEANOTHUS (*Ceanothus americanus* L.).—Erect shrub to 3 feet high; leaves egg-shaped to oblong-egg-shaped, 1 to 3 inches long, pointed at tips, finely and irregularly toothed, dull green above, finely hairy or smooth below; flowers white, borne in large spreading clusters at the ends of the new branches of the season; fruits about 1/4 inch across.

Occurrence.—ISLE ROYALE.

10. DESERT DEERBRUSH (*Ceanothus mol.ssimus* Torr.).—Low, compact shrub 2/3 to 3 feet high, the foliage dull and dingy-looking with fine grayish hairs; leaves thin, broadly elliptic, with 3 main veins from the base, about 2/3 to 1 1/2 (or 2) inches long, finely toothed; flowers white, borne in unbranched clusters near the ends of the branchlets; capsules smooth, nearly round, somewhat 3-lobed at the top, about 1/5 inch in diameter.

Occurrence.—MESA VERDE: upper Morfield Canyon.

11. SNOWBRUSH CEANOTHUS (*Ceanothus velutinus* Dougl.), fig. 97.—Usually a rather low, rounded shrub, 2 to 5 feet high, with several or many stems from the base; leaves thick and leathery, egg-shaped to elliptic, 1 to 2 1/2 inches long, with 3 main veins, shiny dark-green as if varnished on the upper surface, or sticky in var. *laevigatus*, paler beneath, the margins with very fine glandular teeth, the veins hairy below; flowers white, borne in oblong clusters 1 to 4 inches long; fruit small, sticky, about 1/6 inch across, 3-lobed.

Fig. 97. Snowbrush ceanothus (*Ceanothus velutinus*).

A form, smaller in all respects and with thinner, less varnished leaves has been recorded from the upper Kern River and named var. *Lorenzeni* Jepson.

Snowbrush ceanothus, so-called because of the fluffy masses of white flowers, is one of the most widely distributed and most abundant of all our species of Ceanothus, being found on the Pacific slope from British Columbia to California and as far east as Rocky Mountain National Park in Colorado. The bushes may grow 8 to 10 feet high with several ascending stems, or they may be only sprawling shrubs due to the heavy snows which hold the branches down during the winter. They often form impenetrable thickets over extensive areas on mountain summits and plateaus. At Crater Lake this species, along with greenleaf manzanita, frequently forms the dominant undercover on slopes and in open forests. It is often a pioneer species in burned-over areas. The large, leathery leaves with their somewhat sticky or varnished-looking upper surface and often a strong cinnamon odor distinguish this shrub from red stem ceanothus with which it

may be confused. Elk and deer browse the foliage to a certain extent during the winter when more palatable feed is not available.

Occurrence.—OLYMPIC: trail to Constance Ridge. MOUNT RAINIER, rare, 3,000 to 5,500 feet: Crystal Lake trail; Stevens Canyon. CRATER LAKE, common, 5,200 to 7,200 feet: valley adjacent to Wheeler Creek, southeast corner of park; slopes around rim of lake; along south entrance highway. LASSEN, occasional, 6,000 to 8,500 feet: Manzanita Lake. YOSEMITE: Mount Dana. SEQUOIA, occasional: Kern Canyon above Junction Meadows. GLACIER, common on open slopes and in old burned-over areas, 4,000 to 4,800 feet: Belton; St. Mary Lake near Baring Falls; Otokomi Lake trail; Logging Mountain; between Josephine and Swiftcurrent Lakes; Dry Fork Two Medicine Valley. YELLOWSTONE, common throughout the lodgepole pine belt. GRAND TETON, common, 6,500 to 9,500 feet: mouth of Granite Canyon; mountain sides back of national park headquarters; Cascade Canyon along trail; Jackson Lake. ROCKY MOUNTAIN, common in open woods at the upper elevations.

12. FRESNO MAT (*Ceanothus fresnensis* Dudley).—Low, nearly prostrate shrub with thick, spreading branches, forming mat-like clumps sometimes 10 feet across; leaves opposite, small, 1/6 to ¾ inch long, thickish, oblong, slightly broader and shallowly toothed at the tip; flowers bright blue, borne in small clusters; fruits small, about 1/6 inch long, with 3 short horns on the sides near the top; occurs on mountain ridges in the ponderosa pine belt of the middle Sierra Nevada of California.

Occurrence.—YOSEMITE, rare, 5,000 to 6,200 feet: 1¼ miles northeast of Alder Creek ranger station: south of Gin Flat; 1 mile south of Chinquapin.

Fig. 98. Squaw carpet ceanothus (*Ceanothus prostratus*).

13. SQUAW CARPET CEANOTHUS (*Ceanothus prostratus* Benth), fig. 98. — Prostrate shrubs with branches lying along the ground, forming mats; leaves opposite; 1/3 to 1 inch long, thickish, rigid, green above and white or rusty below between the veins, more or less wedge-shaped to oval with large stiff teeth, especially above the base; flowers blue, borne in small, rounded clusters; fruit globose, not lobed, with 3 large wrinkled horns at the top.

Occurrence. — CRATER LAKE: Garfield Peak trail. LASSEN, up to 7,000 feet: Hot Springs Valley. YOSEMITE: Panoche Peak, Mariposa Co., a little west of park boundary south of El Portal.

14. KERN CEANOTHUS (*Ceanothus pinetorum* Cov.).—Low shrub, ½ to 3 feet high; leaves elliptic to roundish, the margins toothed with 5 to 8 stiff, sharp-pointed teeth, smooth above, some very finely fuzzy below, ½ to 1

inch long; flowers blue (or white) borne in dense rounded clusters; fruits with prominent stout horns at the top.

Occurrence.—SEQUOIA, abundant over limited areas in Kern Canyon, 6,500 to 8,800 feet: Kern Canyon; Chagoopa Plateau; Grouse Meadows; near Lion Meadow.

15. BUCKBRUSH CEANOTHUS (*Ceanothus cuneatus* (Hook.) Nutt.).—Spreading or sprawling, rigidly-branched shrub 3 to 10 feet high, often forming impenetrable thickets over large areas; foliage bluish-gray, with a strong balsamic odor; leaves opposite, thickish, 1/6 to ½ (or sometimes nearly 1) inch long, oblong to somewhat wedge-shaped, not toothed, light green above, paler below, conspicuously net-veined; flowers white or rarely bluish, borne in small dense clusters ½ to 1 inch across; fruits oblong or nearly round, with 3 horn-like crests at or near the top. This species crown-sprouts after fire.

Occurrence.—YOSEMITE, rare, about 4,000 feet: 1½ miles southeast of Alder Creek ranger station; Chilnualna trail near creek. SEQUOIA, common, 2,000 to 6,500 feet: Middle Fork Kaweah River below Moro Rock; Kern Canyon (a form resembling Mohave Desert ceanothus).

16. MOHAVE DESERT CEANOTHUS (*Ceanothus vestitus* Greene).—Stout, compact, intricately branched shrub 2 to 5 feet high, strongly resembling buckbrush ceanothus of the Pacific slope; branches short, rigid, some of them spine-tipped; leaves grayish-green, elliptic to oval, rather thick, not toothed or very finely toothed, 1-nerved, borne in pairs on the branches; flowers white, borne in small clusters; capsules nearly round, with 3 small horns on the sides, about ¼ inch in diameter; occurs on open ridges and dry slopes in the piñon-juniper belt. This species is a fairly important winter browse for deer. (Syn. *C. Greggi* Gray as to our area.)[37]

Occurrence.—GRAND CANYON, 4,500 to 7,250 feet. South Rim, rare: Shoshone Point. Canyon: Muav and Bass Canyons: Bright Angel Canyon; below Tahuta Point.

GRAPE FAMILY (Vitaceae)

FIELD GUIDE TO THE GENERA

Leaves lobed, not divided into separate leaflets ..... VITIS, p. 171.
Leaves divided into 5 to 7 leaflets ..... PARTHENOCISSUS, p. 172.

WILD GRAPE (*Vitis* L.)

The wild grapes are woody climbing vines found particularly along streams. Clinging to supports by means of branched tendrils, they straggle over bushes and climb high into trees. The foliage is rather fragrant and the leaves and tendrils have a tart flavor when crushed. Inconspicuous whitish or greenish flowers are borne in branched clusters along the stems opposite the leaves. The grapes are eaten by birds and small mammals and are often collected locally for making jelly. The Indians used them both fresh and dried. The leaves turn a beautiful dark purplish-red in the Fall.

37 Howell, John Thomas. Studies in Ceanothus III. Leaflets West. Bot. 2: 228-240. 1940.

FIELD GUIDE TO THE SPECIES

Leaves 2 to 4 inches across, rather thinnish; berries covered with a whitish bloom; occurs in California parks ..... 1. *V. californica.*

Leaves mostly 1½ to 3 inches across, thickish; berries with scarcely any bloom; occurs in parks of the Southwest ..... 2. *V. arizonica.*

1. CALIFORNIA GRAPE (*Vitis californica* Benth.).—Woody vine with stems 10 to 50 feet or more long; young leaves and twigs usually densely white-hairy or cottony; leaves roundish, shallowly 3-lobed usually above the middle, heart-shaped at the base, mostly 2 to 4 inches in diameter, the margins toothed; flowers small, the whitish petals soon falling, borne in many-flowered clusters along the stems opposite the leaves; fruits globose, about 1/3 inch in diameter, dark purple-black with a whitish bloom, the bunches drooping.

Occurrence.—YOSEMITE, rare, 2,500 to 4,000 feet: Hetch Hetchy Valley; Yosemite Valley at John Muir's fern ledge. SEQUOIA: near Ash Mountain, 1,600 feet; North Fork Kaweah River.

2. CANYON GRAPE (*Vitis arizonica* Engelm.), fig. 99.—Hardly to be distinguished from California wild grape, but the leaves a little smaller; tendrils smaller; berries a little smaller and without a bloom.

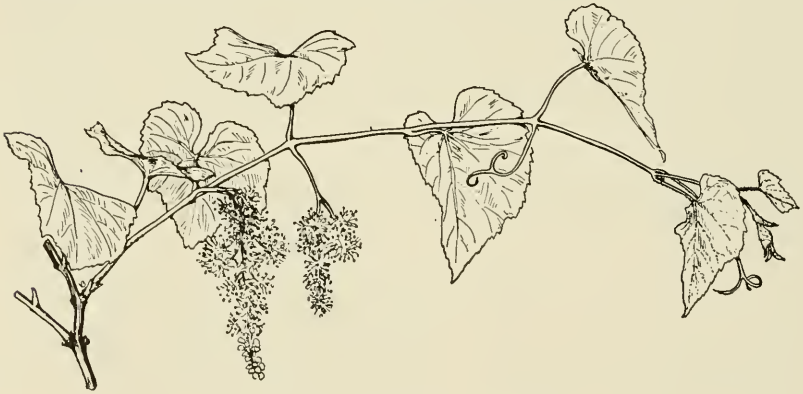

Fig. 99. Canyon grape (*Vitis arizonica*).

Occurrence.—ZION, about 4,500 feet: Zion Canyon north of public camp grounds; Weeping Rock trail; the Narrows trail. GRAND CANYON, in the canyon, 2,500 to 4,700 feet: Indian Gardens and along Garden Creek; Bright Angel Creek above Phantom Ranch; Roaring Springs; Nankoweap Basin; Cataract Canyon.

THICKET CREEPER (*Parthenocissus inserta* (Kern.) Fritsch.).—Trailing vine with smooth bark, clinging by means of long tendrils, these with 3 to 5 branches; leaflets 5 to 7, oval to oblong, 1½ to 4 inches long, pointed at the tips, irregularly toothed; flowers borne in flat-topped clusters about 2 inches across; berries globose, small, about 1/5 to ¼ inch in diameter, bluish-black. (Syn. *P. vitacea* (Knerr) Hitchc.)

This is similar to the cultivated Virginia creeper except that the tendrils have usually fewer branches and are without adhesive discs, and the flower clusters are smaller. Birds are fond of the berries.

Occurrence.—MESA VERDE.

STERCULIA FAMILY (Sterculiaceae)

The two species representing this group in the national parks could scarcely be considered members of the same family at first glance. One is a large coarse shrub or small tree while the other is scarcely, if ever, more than 1 foot high. Both are evergreen and have the 5 stamens united below into a tube.

FIELD GUIDE TO THE GENERA

Coarse shrubs 6 to 10 feet high, or a small tree; leaves broadly egg-shaped to elliptic, ¼ to 2 inches long, thickish, mostly irregularly 3-lobed, the margins toothed; flowers yellow, 1 to 2 inches across; occurs in Sierra Nevada parks of California ..... FREMONTIA, p. 173.

Low shrubs or sub-shrubs ½ to 1 foot high, the stems slender; leaves egg-shaped to oblong-egg-shaped, ¼ to ½ inch long, not lobed, the margins finely toothed; flowers tiny, about ⅛ inch across, brownish; occurs at Grand Canyon National Park ..... AYENIA, p. 173.

CALIFORNIA FREMONTIA, FLANNELBUSH (*Fremontia californica* Torr.), fig. 100.) — Erect, loosely branched shrub, 6 to 10 feet high, or a small tree up to 15 feet high; leaves ¼ to 2 inches long, more or less heart-shaped to egg-shaped or elliptic, usually with 3 short broad lobes, thick and leathery, green above, covered below with dense gray or yellowish felt; flowers large, 1 to 2 inches across, bright yellow, with a central column of 5 stamens; fruits egg-shaped, ¾ to 1⅛ inches long, more or less pointed at the tip, covered with dense brown felt and short, stiff hairs. The common name, flannelbush, is descriptive of the herbage which is densely felty with a soft grayish fuzz, especially on the young shoots. The bush has been cultivated as an ornamental because of its large, showy, yellow flowers.

Occurrence.—SEQUOIA, occasional, 3,000 to 4,200 feet; 3 miles west of Panorama Point; trail to Ash Mountain Lookout; Marble Fork Kaweah River, along Colony Mill trail; ½ mile east of Clough Cave.

Fig. 100. California fremontia (*Fremontia californica*).

DWARF AYENIA (*Ayenia pusilla* L.).— Small spreading evergreen plant with slender woody stems at the base; leaves egg-shaped to oblong-egg-shaped or broadly lance-shaped, ¼ to ½ inch

long, the margins finely toothed; flowers small, about 1/8 inch across, brownish; fruits globose capsules, about 3/16 inch in diameter, covered with dark rough glandular swellings, splitting from the top into 5 sections.

Occurrence.—GRAND CANYON: Creek trail below Phantom Point, 3,000 feet.

TAMARISK FAMILY (Tamaricaceae)

FRENCH TAMARISK (*Tamarix gallica* L.).—This is a conspicuous shrub escaped from cultivation and found in many places in the Southwest, especially along or near water courses, and often forming thickets. The numerous tiny leaves closely clothing the slender stems is suggestive of a type of cedar. The species is sometimes called salt cedar because of its ability to withstand the alkali soil. During the spring and early summer large spreading clusters of small pink flowers are borne at the ends of the branches.

Occurrence.—ZION: along the Virgin River; Coalpits Wash, 3,665 feet. GRAND CANYON. Canyon, occasional: along the Colorado River from Nankoweap Creek to foot of the Tanner trail; Bright Angel Creek near Phantom Ranch.

GINSENG FAMILY (Araliaceae)

AMERICAN DEVIL'S CLUB (*Oplopanax horridum* (Sm.) Miquel.), fig. 101.—Stout thick-stemmed shrub 3 to 6 feet high, the stems and under surface of the leaves densely covered with stout light green or straw-colored prickles; leaf-blades large, 1/3 to 1 foot across, roundish, the margins deeply lobed and irregularly toothed, borne on thick prickly leaf-stems; flowers greenish-white, borne in oblong clusters at the ends of the stems; fruits bright red berries forming club-shaped clusters at the tops of the stems. (Syns. *Fatsia horridus* (Sm.) B. & H., *Echinopanax horridum* (Sm.) Dcne. & Planch.)

This shrub is well named "devil's club" because of the stout spines or prickles which thickly cover the whole plant from the ground up, including

Fig. 101. American devil's club (*Oplopanax horridum*).

even the backs of the large leaves and the thick flowering stalks. The sharp prickles may make very painful wounds which may become infected. Hence they are sometimes reputed to be poisonous.

American devil's club has an interesting distribution, being found in widely separated areas with no known connection between them. It is common along streams and in wet places in the northwestern part of North America from southern Alaska to California and the Rocky Mountains. From there we find a wide gap to Lake Superior where it occurs on Isle Royale. It is also found in Japan.

Occurrence.—OLYMPIC: junction of Godkin Creek and Elwha River, 2,000 feet; Canyon Creek. MOUNT RAINIER, common: Longmire road; Ohanapecosh Hot Springs; White River. CRATER LAKE, rare: extreme northwest corner of park, 5,500 feet. GLACIER, common, 3,100 to 4,500 feet: Lake McDonald; Avalanche Creek, St. Mary Lake; trail to Gunsight Lake. ISLE ROYALE, occasional: Blake Point; Smithwick Island; Passage Island; Gull Islands.

OLEASTER FAMILY (Eleagnaceae)

FIELD GUIDE TO THE GENERA

Leaves opposite; herbage grayish- or rusty-mealy, or silvery gray; found mostly in Rocky Mountain and Southwest parks ..... SHEPHERDIA, p. 175.

Leaves alternate; herbage white-silvery; occurs in Rocky Mountain parks ..... ELEAGNUS, p. 176.

BUFFALOBERRY (*Shepherdia* Nutt.)

The buffaloberries may be recognized by the scurfy or mealy leaves which are rusty-spotted or silvery-gray, at least below. The flowers are inconspicuous and without petals. The berries of the silver buffaloberry have a pleasant tart flavor. Travelers crossing the country in the early days made them into a sauce used as a garnish for buffalo steaks, hence the common name, buffaloberry. The Indians dried them for Winter use. The berries of the other two species are not palatable. Those of russet buffaloberry are insipid and bitter while those of roundleaf buffaloberry are dry and silvery-scurfy like the leaves. All are utilized, however, by birds and small mammals. (Syn. *Lepargyrea* Raf.).

FIELD GUIDE TO THE SPECIES

Leaves elliptic; fruits bright red or yellowish, smooth and currant-like, not scurfy; found in Rocky Mountain and Northwest parks.

Branchlets spine-tipped; leaves densely silvery-scurfy below and thinly so above; berries tart, edible ..... 1. *S. argentea.*

Branchlets not spine-tipped; leaves dull green above, rusty-scurfy below; berries insipid and bitter ..... 2. *S. canadensis.*

Leaves round to oval, grayish-silvery above, densely white-scurfy below; berries densely covered with whitish scurf; occurs in parks of the Southwest ..... 3. *S. rotundifolia.*

1. SILVER BUFFALOBERRY (*Shepherdia argentea* Nutt.).—Stout shrub or small tree 4 to 15 feet high with spine-tipped branchlets and silvery-gray

Fig. 102. Russet buffaloberry (*Shepherdia canadensis*).

foliage; young twigs brownish or silvery-scurfy; leaves borne in opposite pairs on the stems, oblong, 1 to 1½ inches long, thickly coated below with a silvery-gray meal or scurf and thinly so above; flowers small, inconspicuous, clustered in the leaf-axils; berries oblong, about ¼ inch long, bright red, borne in dense clusters.

Occurrence.—BRYCE CANYON: near spring in main canyon, near east boundary.

2. RUSSET BUFFALOBERRY (*Shepherdia canadensis* Nutt.), fig. 102.—Thornless shrub, 3 to 6 or 10 feet high; leaves opposite, ¾ to 1½ inches long, dull green above, very scurfy below and dotted with rusty patches; flowers small, inconspicuous, yellowish, clustered in the leaf-axils; berries ovoid, red to yellowish, about the size of a small currant, rather insipid and bitter; occurs usually in moist open woods.

Occurrence.—GLACIER, common, 3,100 to 5,000 feet: Kintla Lake; Crossley valley; Lake McDonald; St. Mary Lake; Swiftcurrent Lake; Red Eagle Lake; Two Medicine valley. YELLOWSTONE, 7,000 to 8,500 feet: near east entrance; Sylvan Pass; West Thumb. GRAND TETON, 6,500 to 9,000 feet: Open Canyon; eastern park boundary near Moose. ROCKY MOUNTAIN, occasional. ISLE ROYALE: Rock Harbor, on island near Rock Harbor Lodge; Tobin Harbor, on trail to Palisades. BRYCE CANYON, higher elevations: southern part of park.

3. ROUNDLEAF BUFFALOBERRY (*Shepherdia rotundifolia* Parry).—Low, densely branched shrub with silvery-gray branches; leaves opposite, persistent, round to oval, tending to be somewhat cupped or concave from below, 1/3 to 1 1/3 inches long; olive-gray above, densely white-scurfy or mealy below; flowers small, borne in clusters in the leaf-axils; fruits round, covered with a whitish meal.

Occurrence.—BRYCE CANYON: near eastern boundary. ZION: near west entrance, 4,000 feet. GRAND CANYON, 6,500 to 8,000 feet. North Rim, below the rim: Cape Royal. South Rim: Hopi Point; Lipan Point.

SILVERBERRY (*Eleagnus commutata* Bernh.), fig. 103.—Stout bushy shrub 6 to 12 feet high or sometimes a small tree up to 15 feet high, closely related to the buffaloberries but the leaves alternate instead of opposite; leaves elliptic, pointed at the tips, 1 to 2½ inches long, silvery-scurfy on both sides but more densely so below; flowers solitary or several clustered in the leaf-axils, 4-lobed, about 1/3 to ½ inch long, tubular, very silvery on the outside, yellowish

within; petals none; fruits oblong, silvery, 1/3 to nearly 1/2 inch long, dry and mealy. (Syn. *Eleagnus argentea* Pursh.) This species is commonly found along streams.

Occurrence. — GLACIER, occasional, 3,100 to 4,500 feet: North Fork Flathead River road a little south of Kishenehn ranger station; near mouth of Logging Creek; shore of St. Mary Lake near East Glacier campground; along creek at outlet of St. Mary Lake; road from Babb to Many Glacier. YELLOWSTONE, rare: near Gardiner. GRAND TETON: near eastern park boundary along Snake River.

Fig. 103. Silverberry (*Eleagnus commutata*).

SILKTASSEL FAMILY (Garryaceae)

SILKTASSEL (*Garrya* Dougl.)

Silktassel is so called because of the long silvery-silky tassel-like flower clusters which hang from the axils of the upper leaves. The whole bush usually has a silvery-gray appearance. The plants are sometimes grown as ornamentals because of the evergreen leaves and the showy tassel-like flower clusters. The silktassels have some value as browse for deer, but the herbage is very bitter. For this reason some species have been called quinine bush. A decoction made from the bark, leaves and fruits was used by the early settlers as a tonic or as a fever remedy.

FIELD GUIDE TO THE SPECIES

Lower surface of leaves not hairy or with few scattered hairs; fruits usually not hairy ..... 1. *G. Fremonti.*

Lower surface of leaves silky-hairy; fruits densely hairy ..... 2. *G. flavescens.*

1. FREMONT SILKTASSEL (*Garrya Fremonti* Torr.), fig. 104.—A much branched evergreen shrub or small tree 4 to 10 feet high; leaves opposite, elliptic to oblong-egg-shaped, about 1 to 2½ inches long, smooth and green above, paler below; young leaves and flower clusters silky-hairy; male and female flowers on separate plants, borne in slender, silky, tassel-like clusters hanging singly or in bunches from the leaf axils near the ends of the branches; male flower clusters about 4 to 7 inches long; female flower clusters 1½ to 4 inches long; fruits dark purple-black berries, about ¼ inch in diameter, usually not hairy, the flesh dry.

Occurrence.—CRATER LAKE, rare: Redblanket Creek; near southwestern park boundary, 4,500 feet. YOSEMITE, up to 6,500 feet: Snow Creek; near head of Nevada Falls.

Fig. 104. Fremont silktassel (*Garrya Fremonti*).

2. YELLOWLEAF SILKTASSEL (*Garrya flavescens* Wats.).—Large spreading shrub similar to Fremont silktassel but the bushes usually with a more grayish appearance and the leaves silky-hairy below; fruits usually densely hairy; occurs on dry mountain slopes and ridges, especially in parks of the Southwest. (Syns. *G. pallida* Eastw., *G. mollis* Greene.)

Occurrence.—KINGS CANYON: near mouth of Bubbs Creek. SEQUOIA, 3,000 to 6,500 feet: Clough Cave; Kern Canyon just south of park boundary. ZION: Emerald Pool. GRAND CANYON, 6,200 to 8,500 feet. North Rim: Bright Angel Point; Kaibab Forest. Canyon, common north of the Colorado River, rare south of river: Bright Angel Trail about 1 mile above Indian Gardens; Kaibab Trail above Roaring Springs junction.

DOGWOOD FAMILY (Cornaceae)

DOGWOOD (*Cornus* L.)

The Dogwoods are chiefly moisture-loving plants commonly found growing along streams or in moist forests. The name, Cornus, comes from the Latin, *cornu,* meaning horn, referring to the hardness of the wood. The common name, dogwood, is said to have arisen from the old English practice of steeping the bark to make a solution to wash "mangy" dogs. A decoction of the very bitter bark was used by the Indians as a tonic or in the treatment of fevers.

FIELD GUIDE TO THE SPECIES

Low trailing plant with erect stems 2 to 8 inches high; flower cluster surrounded by 4 white petal-like bracts ..... 1. *C. canadensis.*

Erect shrubs or small trees 3 to 15 (or 30) feet high.

Flowers borne in rather loose flat-topped clusters 1½ to 2½ inches across; fruits white or bluish ..... 2. *C. stolonifera.*

Flowers borne in compact heads surrounded below by 4 to 6 white petal-like bracts; fruits red ..... 3. *C. Nuttalli.*

1. BUNCHBERRY DOGWOOD (*Cornus canadensis* L.), fig. 105.—Small

plant with stems 2 to 8 inches high; leaves 1 to 2 inches long, 4 to 6 in a circle near the top of the stem, often a single pair below, egg-shaped, with a short point at the tip; flowers small, greenish, borne in a dense head at the top of each erect stem, the head surrounded by 4 white petal-like bracts; bracts 1/3 to ¾ inch long; fruits bright red, about 1/6 to ¼ inch in diameter.

This is an attractive little plant usually found growing in rich moist soil in the woods, often forming carpets under the trees. It is widely distributed over the northern part of North America as far south as northern California and Colorado. The leaves turn a beautiful red in the Fall. The berries are eaten by birds and small mammals.

Fig. 105. Bunchberry dogwood (*Cornus canadensis*).

Occurrence.—OLYMPIC, common, 1,500 to 4,000 feet: Mount Angeles; Solduc Hot Springs; Elwha Basin; Constance Ridge. MOUNT RAINIER, common in the open woods, 2,000 to 3,500 feet: between Stevens Creek and Canyon Bridge. CRATER LAKE, rare, near western park boundaries: Redblanket Creek; Bybee Creek. GLACIER, common on the west side in wooded areas, 3,100 to 4,600 feet: Lake McDonald Hotel; Bowman Lake; Kintla Lake; park headquarters; trail to Avalanche Lake. ISLE ROYALE, common in the woods: Rock Harbor Lodge; Mott Island.

Fig. 106. Red-osier dogwood (*Cornus stolonifera*).

2. RED-OSIER DOGWOOD (*Cornus stolonifera* Michx.), fig. 106.—Much-branched shrubs 3 to 15 feet high with smooth, dark brown to reddish-purple bark; leaves narrowly egg-shaped, mostly pointed at the tip, about 2 to 4 inches long, the margins not toothed, borne opposite each other on the stems; flowers small, white or greenish, borne in flat-topped clusters 1½ to 2½ inches across; fruits white or bluish, nearly round, about ¼ inch in diameter, juicy and bitter. (Syn. *C. instolonea* Nels.).

Red-osier dogwood is widespread in the United States and abundant in most of the western national parks and on Isle Royale. Two Pacific coast forms commonly considered as different species or varieties are so similar to red-osier dogwood that we are not here distinguishing between them. These are creek dogwood (*Cornus californica* May.) and its variety *pubescens* Mcbr. (syn. *C. occidentalis* Cov.) The distinctions are based on the character of the hairiness of the leaves.[38]

The shrubs are conspicuous along streams because of their smooth purplish-red branches which are especially prominent early in the Spring before the leaves appear. Later, in the Fall, the leaves become a beautiful dark purplish-red color. Small white or greenish flowers are borne in more or less flat-topped clusters without the petal-like bracts which are so conspicuous in the Pacific dogwood tree and in the small bunch-berry dogwood. The fruits are juicy white or bluish berries. The herbage is too bitter to be very palatable as a browse for animals, but it is eaten to some extent by deer and elk.

Occurrence.—OLYMPIC: Lake Crescent. MOUNT RAINIER. CRATER LAKE: lower Redblanket Creek. LASSEN: Manzanita Creek; Kings Creek. YOSEMITE: Benson Lake; Lake Merced; junction of Clark and Gray Creeks. KINGS CANYON: Kings River Canyon; General Grant Grove. SEQUOIA: Marble Fork Kaweah River; Giant Forest; Dorst Creek. GLACIER, common, 3,150 to 5,000 feet: Belton; east end of Logging Lake; McDonald Creek; Avalanche campground; Waterton ranger station; Swiftcurrent Creek; Two Medicine Lake; St. Mary Lake; Red Eagle Lake. YELLOWSTONE: Mammoth Hot Springs. GRAND TETON: east of park boundary near Moose, 6,500 feet. ROCKY MOUNTAIN. ZION: trail from Zion Lodge to Birch Creek, 4,500 feet. GRAND CANYON, 7,500 to 8,800 feet. North Rim and just below: Neal Spring; Bright Angel Point; Top of Kaibab Trail; Bright Angel Spring. ISLE ROYALE, common around lakes and swamps or along streams: Mott Island; Rock Harbor.

3. PACIFIC DOGWOOD (*Cornus Nuttalli* Aud.).—Tall shrub or small tree 10 to 30 feet high with usually smooth reddish or ashy brown bark; leaves opposite, broadly oblong to oval or roundish, rounded or shortly pointed at the tips, 3 to 5 inches long; flowers greenish or yellowish, crowded into heads ½ to 1 inch across, the heads surrounded by 4 to 6 conspicuous white, petal-like bracts 1½ to 3 inches long; fruits red, ½ inch long, borne in dense head-like clusters.

Occurrence.—OLYMPIC, occasional: Lake Crescent; Elwha River; north of Wildrose Creek, 2,500 feet. MOUNT RAINIER, rare in Douglas fir and western hemlock forests: near Ohanapecosh Hot Springs. CRATER LAKE, rare: Redblanket Canyon. YOSEMITE, occasional. SEQUOIA, occasional: along the General's Highway above Ash Mountain; northeast of Marble Falls; Colony Mill; Garfield Forest.

HEATH FAMILY (Ericaceae)

FIELD GUIDE TO THE GENERA

1. *Leaves scale-like or linear, not more than ⅝ inch long, densely clothing the stems; low alpine shrubs.*

Leaves less than ¼ inch long, awl-shaped or linear; flowers white; found in Pacific coast parks ..... CASSIOPE, p. 181.

Leaves ¼ to ⅝ inch long, linear; flowers red or whitish to yellow; found in parks of the Pacific coast and Rocky Mountains ..... PHYLLODOCE, p. 182.

38 Jepson, W. L., Flora of California, vol. 2, p. 678. 1936.

2. *Leaves not scale-like, seldom linear, ½ to 8 inches long.*

Leaves opposite; flowers saucer-shaped, purplish-red; found in parks of the Pacific coast and Rocky Mountains ..... KALMIA, p. 184.

Leaves alternate; flowers white, pinkish, or copper-red.

Fruits dry capsules.

Flowers with 5 separate petals.

Flowers white, about ½ inch across, borne in dense flat-topped clusters at the ends of the branches; widely distributed .... LEDUM, p. 185.

Flowers copper-red, about 1 inch across, borne singly at the ends of the branches; occasional in the Northwest ..... CLADOTHAMNUS, p. 185.

Flowers bell-shaped, urn-shaped, or funnel-shaped.

Flowers showy, ½ to 2 inches long, narrowly bell-shaped to funnel-shaped, irregularly divided into 5 spreading lobes; fruits dry capsules; found in parks of the Pacific coast ..... RHODODENDRON, p. 186.

Flowers small, about ¼ to ½ inch long, bell-shaped to urn-shaped.

Evergreen shrubs with somewhat leathery leaves; capsules splitting down backs of cells.

Leaves oblong to elliptic, green above, pale or rusty below, not whitish.

Shrubs 2 to 5 feet high; leaves smooth on both sides; found in California parks, ... LEUCOTHOE, p. 187.

Shrubs 1 to 3 feet high; leaves rusty-scurfy below; eastern species found on Isle Royale ..... CHAMAEDAPHNE, p. 187.

Leaves narrowly oblong to linear, mostly curled under from the edges, dark green above, whitish below ..... ANDROMEDA, p. 188.

Deciduous shrubs with thinnish leaves; capsules splitting at the partitions ..... MENZIESIA, p. 188.

Fruits berries or berry-like.

Fruits with calyx remaining at base or surrounded by fleshy calyx which becomes part of the fruit.

Berries dry, with several stony seeds ..... ARCTOSTAPHYLOS, p. 189.

Berries juicy, with numerous small seeds ..... GAULTHERIA, p. 194.

Fruits crowned by persistent calyx-lobes.

Slender trailing plants with appressed-bristly stems; leaves less than 1/3 inch long; flowers white; berries white.... CHIOGENES, p. 196.

Erect or trailing plants with smooth or hairy stems; leaves more than 1/3 inch long, or if smaller, the flowers pink; berries red or purple ..... VACCINIUM, p. 196.

WHITE HEATHER (*Cassiope* D. Don.)

FIELD GUIDE TO THE SPECIES

Leaves awl-shaped, closely appressed to the stems in 4 rows; flowers on slender stems ½ to 1 inch long in the upper leaf-axils ..... 1. *C. Mertensiana.*

Leaves linear, spreading; flowers on very short stems at the ends of the branchlets ..... 2. *C. Stelleriana.*

1. MERTENS CASSIOPE, WHITE HEATHER (*Cassiope Mertensiana* (Bong.) G. Don).—Low, tufted evergreen shrub, 2 to 15 inches high, the branches tending to be erect; leaves small, awl-shaped to lance-shaped, thick, smooth, closely overlapping each other in 4 rows; flowers bell-shaped, white, borne singly in the leaf-axils towards the ends of the branches on slender nodding stems 1/2 to 1 inch long; fruits dry capsules; roundish, splitting into 4 or 5 sections to free the numerous tiny seeds.

Mertens cassiope is a subalpine species found at and just below timberline, sometimes covering large areas in alpine meadows. The species is of little importance as a browse. The genus is named after Cassiope, the wife of Cepheus, a fabulous king of Ethiopia.

Occurrence.—OLYMPIC, common, 5,000 to 6,000 feet: Mount Angeles; Constance Ridge; Marmot Lake; Deer Lake; Boulder Creek, 5 miles above Olympic Hot Springs; Hurricane Ridge. MOUNT RAINIER, common on open slopes, 4,500 to 6,000 feet: trail to Reflection Lake; Paradise Park; Mazama Ridge; Finger Peak, near North boundary of park. LASSEN: Lassen Peak; Bumpas Hell trail. YOSEMITE, occasional, 8,000 to 12,000 feet; upper Young Lake; Smedberg Lake; Mount Clark; Mount Lyell; Muir Pass; Cloud's Rest; Dana Meadows; Tuolumne Meadows. KINGS CANYON, rare: Ouzel Basin. SEQUOIA: Heather Lake, 9,000 feet.

2. STARRY CASSIOPE, ALASKA WHITE HEATHER (*Cassiope Stelleriana* DC.).—Low spreading shrubs forming dense mats several inches high; leaves narrowly oblong to linear, thickish, densely crowded on the stems, spreading; flowers bell-shaped, white, 1/4 to 3/8 inch long, borne singly at the ends of the branchlets, on short stems or almost unstalked; fruits dry capsules, roundish, splitting into 5 sections. (Syn. *Harrimanella Stelleriana* (Pall.) Cov.)

Occurrence.—MOUNT RAINIER, rare near the limit of trees: Paradise Valley, cliffs overlooking Nisqually Glacier.

MOUNTAINHEATH (*Phyllodoce* Salisb.).

The mountainheaths are low alpine shrubs with many short branches and small, thick, linear leaves crowded along the stems. The leaves resemble those of black crowberry, *Empetrum nigrum,* hence the specific name, *empetriformis,* for one of the species. The two red-flowered species are among the most conspicuous spring and early summer flowers in the high country of the parks of the Rocky Mountains and Pacific slope. The plants often form extensive patches in moist open meadows or around lakes.

FIELD GUIDE TO THE SPECIES

Flowers with corolla 5-lobed, the lobes much shorter than the tube; stamens not exserted; found in Rocky Mountain and Northwest parks.

Corolla bell-shaped, red; sepals mostly blunt-pointed ..... 1. *P. empetriformis.*

Corolla narrowly bell-shaped, light yellow to cream color; sepals usually narrowly pointed ..... 2. *P. glanduliflora.*

Flowers with corolla divided to middle into 5 lobes; stamens exserted from the corolla; found in California parks ..... 3. *P. Breweri.*

1. RED MOUNTAINHEATH (*Phyllodoce empetriformis* (Sm.) Don.), fig. 107.—Low, densely-branched, evergreen shrub 6 to 20 inches high; leaves

dark green, leathery, 1/4 to 1/2 inch long, linear, with the edges rolled under, crowded on the stems; flowers small, bell-shaped, red, borne on slender stems in clusters of several at the ends of the branches; fruits small globose capsules, splitting from the top into 5 sections.

Red mountainheath is one of the most common and conspicuous of the alpine shrubs, often covering considerable areas in high mountain meadows, particularly in the northern parks. The plants are low, seldom becoming more than 1 foot high and during the spring and early summer the clusters of red, heather-like flowers furnish a bright and showy ground cover in the "mountain parks." Paradise Park at Mount Rainier is notable for its luxuriant growth of red mountainheath.

Fig. 107. Red mountainheath (*Phyllodoce empetriformis*).

Occurrence.—OLYMPIC, common, 3,000 to 5,000 feet; Mount Angeles; Baldy Peak; Constance Ridge; Marmot Lake; peak at junction of Elwha River and Godkin Creek; Hurricane Ridge. MOUNT RAINIER, abundant, open slopes 5,000 to 8,000 feet: Paradise Valley; trail to Reflection Lake; Mazama Ridge. CRATER LAKE: reported from Llao Rock. GLACIER, abundant in alpine meadows, 5,000 to 9,000 feet: Sperry Glacier; Logan Pass; Hanging Gardens; Granite Park; Swiftcurrent Pass; Iceberg Lake; Grinnell Glacier; Cracker Lake; Razor Edge Mountain; Piegan Pass; Cut Bank Pass; Indian Pass. YELLOWSTONE, occasional: upper Yellowstone Falls. GRAND TETON, common at and above timberline, 9,000 to 10,000 feet: Kinnikinnick Lake; upper end of Cascade Canyon; Amphitheatre Lake; head of Death Canyon.

2. CREAM MOUNTAINHEATH (*Phyllodoce glanduliflora* (Hook.) Cov.). —Low shrub, 4 to 12 feet high, the branches crowded, ascending; leaves 1/4 to 1/2 inch long, linear, with inrolled margins, thick and leathery, crowded along the stems; flowers small, narrowly bell-shaped, light yellow to cream-color, borne in few- to several-flowered clusters at the ends of the stems, the flower stems sticky-glandular; capsules small, more or less globose.

Occurrence.—OLYMPIC, occasional: Mount Claywood near Hayden Pass; Mount Duckabush. MOUNT RAINIER, occasional, 5,000 to 8,000 feet: Paradise Park; near Pinnacle Glacier, Tatoosh Range. CRATER LAKE, occasional, 7,000 to 8,000 feet: the Watchman; Llao Rock, inner slope near summit; Devil's Backbone; east slope of Union Peak. GLACIER, occasional above timberline: Logan Pass; Sexton Glacier; Piegan Pass; Preston Park; Gunsight Pass; Swiftcurrent Pass. YELLOWSTONE. GRAND TETON: Cascade Canyon, 10,000 feet.

3. BREWER MOUNTAINHEATH (*Phyllodoce Breweri* (Gray) Hel.).— Low alpine shrub 1/3 to 1 foot high, with rigid branches; leaves narrow, 1/4 to

½ inch long, with the margins rolled under; flowers borne in several-flowered clusters at the ends of the branches, rose-red, deeply saucer-shaped to bowl-shaped, 1/3 to ½ inch across, divided about ½ into 5 spreading lobes; capsules small, splitting from the top into 5 sections.

Occurrence.—LASSEN: Summit Lake, 6,950 feet; Lassen Peak; Bumpas Hell trail; Kings Creek Meadows. YOSEMITE, 9,000 to 12,000 feet: south side of Mount Conness; Mount Lyell; base of Mount Clark; Vogelsang Pass; Mount Hoffman; Donohue Pass; summit of Cloud's Rest. KINGS CANYON: above Reflection Lake; General Grant Grove. SEQUOIA, 9,000 to 12,000 feet: Alta Peak; Heather Lake; Tocopah Falls; west of Cyclone Meadow; Twin Lakes; Mount Whitney; Hockett Meadows; Little Kern River.

KALMIA (*Kalmia* L.)

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Plants 1 to 2½ feet high; leaves ½ to 1½ inches long; found in swamps or bogs ..... 1. *K. polifolia.*

Plants 3 to 8 inches high; leaves ¼ to ½ inch long; found in alpine meadows ..... 1a. Var. *microphylla.*

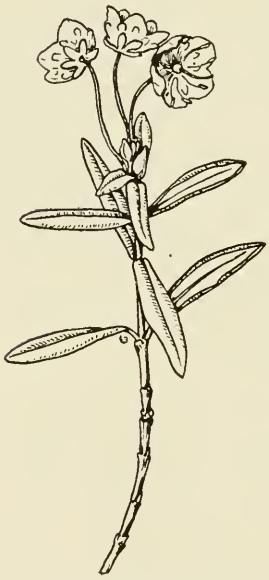

Fig. 108. Bog kalmia (*Kalmia polifolia*).

1. BOG KALMIA, SWAMP LAUREL (*Kalmia polifolia* Wang.), fig. 108.—A small, straggling evergreen shrub, 1 to 2½ feet high; leaves opposite each other on the stems, ½ to 1½ inches long, shiny green above, whitish below, elliptic to oblong, the margins rolled under so that they appear narrowly linear; flowers saucer-shaped, about ½ inch across, purplish-red, borne several on slender stems at the ends of the branches; fruits small oblong to globose pods, splitting into 5 sections from the top.

Bog Kalmia is found growing in swamps or bogs. The purplish-red, saucer-shaped flowers are peculiar in that they have 10 small pockets on the inside of the corolla in which the stamens are fitted. When the flower is jostled or struck lightly as by a bee, the stamens are released and the body of the bee is dusted with pollen. The bee then flies to another flower, leaving some pollen, and thus making possible cross-fertilization. A form from Mount Rainier with large flowers and long, narrow leaves has been described as *Kalmia occidentalis* Small.

Occurrence.—OLYMPIC: Lost Lake. MOUNT RAINIER, occasional on the west side, 5,000 to 6,000 feet: swamp near road to Mowich Lake; Nisqually Valley. CRATER LAKE, occasional, in the upper forests: 2 miles southwest of the Watchman; Castle-crest Garden; near park headquarters; near Annie Spring. LASSEN: King's Creek Meadow where road crosses, 7,300 feet; Lassen Peak; Bumpas Hell trail. GLACIER, on the west side, about 3,200 feet: Lake McDonald; sphagnum bog at John's Lake. ISLE ROYALE, common in the bogs: Mott Island.

1a. ALPINE BOG KALMIA, ROCKY MOUNTAIN LAUREL (Var. *microphylla* Hook.).—Differs from bog kalmia in being only 3 to 8 inches high; leaves oval or egg-shaped to broadly oblong, 1/4 to 1/2 inch long; occurs in open alpine meadows.

Occurrence.—MOUNT RAINIER, 6,000 to 8,000 feet: near Nisqually Glacier. LASSEN; Lassen Peak. YOSEMITE, occasional, 7,000 to 12,000 feet; Neall Lake; Vogelsang Pass; above Lake Tenaya; Tuolumne Meadows; west side of Cathedral Peak; Elizabeth Lake; Donohue Pass. KINGS CANYON: Harrison Pass trail. SEQUOIA, 8,000 to 12,000 feet: Kaweah Peaks; Twin Lakes; Hockett Meadows; near Mineral King; Panther Meadow. GLACIER, common, 5,000 to 8,000 feet: Sperry Glacier trail; trail to Hidden Lake; Logan Pass; Granite Park; Swiftcurrent Pass; Iceberg Lake; above Morning Eagle Falls. YELLOWSTONE, occasional: Spring Creek. GRAND TETON, occasional, 6,800 to 9,500 feet: Kinnikinnick Lake; Amphitheatre Lake; shore of Leigh Lake. ROCKY MOUNTAIN, occasional, 10,000 ot 11,000 feet: Long's Peak and vicinity; Dream Lake.

LABRADOR-TEA (*Ledum* L.)

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Leaves resin-dotted and whitish below, smooth above and below .....1. *L. glandulosum.*
Leaves covered below with dense rusty wool .....2. *L. groenlandicum.*

1. WESTERN LABRADOR-TEA (*Ledum glandulosum* Nutt.).—Rigidly-branched shrub 1 to 5 feet high; leaves fragrant when crushed, oval to oblong or oblong-egg-shaped, 1/2 to 2 inches long, leathery, dark green above, pale or whitish and resin-dotted below, the margins tending to curl under; flowers white, about 1/2 inch across, with 5 separate petals, borne at the ends of the stems in flattish or round-topped clusters 1 to 2 inches across; capsules oval, splitting along the partitions into 5 sections.

Occurrence.—LASSEN: Hot Springs Creek below Devil's Kitchen, 5,700 feet; near Forest Lake. YOSEMITE, occasional, 6,000 to 9,500 feet: Tuolumne Meadows; Eagle Peak Meadows; Nevada Falls trail to Cloud's Rest; Lake Tenaya; Mount Lyell; Clark Creek below Mount Clark; Royal Arch Lake; Yosemite Falls trail; Ireland Lake trail; near Kibbie Lake, northwest corner of park. KINGS CANYON: Reflection Lake. SEQUOIA, occasional: Alta Meadows; Alta Peak; Heather Lake trail; Hockett Meadows. GLACIER, rare, 3,100 to 6,500 feet: Belton, near park headquarters; trail on west side below Boulder Pass. YELLOWSTONE, occasional, 6,000 to 8,000 feet: near Hot Springs pool; near Cub Creek Canyon on east entrance road; 2 miles east of Lone Star Geyser junction; junction of Yellowstone River and Boiling River. GRAND TETON.

2. LABRADOR-TEA LEDUM (*Ledum groenlandicum* Oeder).—Similar to western Labrador-tea but the under surface of the leaves densely rusty-woolly instead of whitish; a species of the far North, the leaves of which were used in Greenland and Labrador as a substitute for tea.

Occurrence.—OLYMPIC, rare. MOUNT RAINIER, rare: Longmire. ISLE ROYALE, common in swamps: Mott Island.

COPPERBUSH (*Cladothamnus pyrolaeflorus* Bong.).—Erect deciduous shrub, 3 to 6 feet high, the leaves often tending to be bunched towards the ends of short branchlets; leaves oblong to spatula-shaped, rounded or blunt-pointed at the tip, 3/4 to nearly 2 inches long, not toothed, bright green above, paler below; flowers copper-colored, about 1 inch across, borne singly or few at the ends of the branchlets; petals 5, oblong, not united; fruits small

pods, flattened-globose, deeply 5-lobed, splitting at the partitions into 5 sections.

Occurrence.—OLYMPIC, occasional: Deer Lake; Mount Baldy.

RHODODENDRON, AZALEA (*Rhododendron* L.).

Rhododendron is from the Greek *rhodon* (rose) and *dendron* (tree). The flowers of all the species are large and conspicuous, with irregularly 5-lobed corollas. The thin-leaved azaleas are poisonous to livestock and the evergreen tough-leaved coastal species reported to be poisonous.[39]. Honey made from the blossoms has the reputation of producing a purgative and emetic effect.

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Evergreen shrubs; leaves thick and leathery, glossy-green above; flowers rose-pink; occurs only in Olympic National Park ..... 1. *R. macrophyllum.*

Shrubs not evergreen; leaves thinnish, not glossy above; flowers white or light pink.

Flowers 1½ to 2 inches long, white or pink, the upper lobe of corolla with yellow splotch; occurs in Yosemite National park ..... 2. *R. occidentale.*

Flowers ½ to 1 inch long, white or cream, the center greenish; occurs in parks of the Northwest ..... 3. *R. albiflorum.*

1. COAST RHODODENDRON, CALIFORNIA ROSE-BAY (*Rhododendron macrophyllum* Don.).—Erect evergreen shrub 4 to 8 feet high; leaves 3 to 6 inches long, oblong to elliptic; pointed at the tip, thick and leathery, shiny green above, paler or rusty below; flowers rose-pink, broadly funnel-shaped, about 1 to 1½ inches long, irregularly 5-lobed, the upper lobe greenish-dotted on the inside; capsule ovoid, splitting into 5 sections. (Syn. *R. californicum* Hook.)

Coast rhododendron is the most showy of the rhododendrons with its large, shiny, evergreen leaves and large rose-pink flowers clustered at the ends of the stems. It is often planted as an ornamental. This is a common species in the Pacific Coast forests, mostly at the lower elevations near the coast.

Occurrence.—OLYMPIC, rare in the park: Elwha River Valley on northwest side of Mount Norton, 3,600 feet; trail to Constance Ridge.

2. WESTERN AZALEA (*Rhododendron occidentale* (T. & G.) Gray).—Handsome, widely-branched shrub 2 to 10 (or 14) feet high; leaves thinnish, 1 to 4 inches long, oval to reverse-egg-shaped, tapering to the base and usually short-pointed at the tip, thinly hairy, tending to be bunched towards the ends of the branchlets; flowers white or pinkish, with a yellow splotch on the upper corolla-lobe, 1½ to 2 inches long, funnel-shaped, divided into 5 slightly irregular lobes, borne in clusters of several at the ends of the branches; fruits dry pods, ½ to ¾ inch long, splitting into 5 sections, many-seeded.

Western azalea is a beautiful shrub found along stream banks or in wooded canyons in Yosemite National Park. The large, fragrant flowers

39 Range Plant Handbook B 128: United States Department of Agriculture, Forest Service. 1937.

make this an attractive ornamental species although it is not an evergreen. The foliage has been found to be poisonous to livestock.

Occurrence.—YOSEMITE, occasional, 4,000 to 8,300 feet: Yosemite valley; near Sentinel Hotel; Mirror Lake; near Glacier Point; Cloud's Rest trail; Illilouette Creek; ¾ mile southwest of Crescent Lake; Lake Eleanor.

3. CASCADES AZALEA (*Rhododendron albiflorum* Hook.).—Shrub 2 to 4 feet high with erect or clustered branches; leaves thinnish, oblong, pointed at both ends, 1 to 2½ inches long, occurring in bunches of 5 to 10 towards the ends of the stems; flowers bell-shaped, ½ to 1 inch long, creamy-white or yellowish with a greenish center, borne in nodding clusters of 1 to 3; capsule splitting into 5 sections.

This is a small shrub common in the parks of the Northwest. It is usually found in scattered patches at the higher elevations, but is sometimes one of the dominant shrub species in the middle elevation forests. The foliage is poisonous to livestock.

Occurrence.—OLYMPIC, common, 3,500 to 6,000 feet: Lake Margaret near Low Divide; Marmot Lake; Marmot Pass, east of park boundary; Constance Ridge. MOUNT RAINIER, abundant, 4,500 to 5,500 feet: Paradise Park; trail to Reflection Lake.

BLACK LAUREL LEUCOTHOE (*Leucothoe Davisiae* Torr.).—Erect evergreen shrub 2 to 5 feet high; stems yellowish-brown; leaves oblong to elliptic, ¾ to 3 inches long, mostly blunt-pointed, dark shiny green above, paler below, smooth on both sides, the margins toothed or not toothed; flowers white, small, about ⅜ inch long, urn-shaped, borne on short nodding stems on simple erect branches 2 to 4 inches long; fruits flattened-globose capsules, splitting down the backs of the cells.

Black laurel occurs in the California parks where it is commonly found in wet places. The herbage has been found to be poisonous to livestock[40] and it is seldom browsed.

Occurrence.—YOSEMITE, occasional, 5,000 to 7,000 feet: west of Crane Flat; Tuolumne Grove; Merced Grove.

LEATHERLEAF (*Chamaedaphne calyculata* (L.) Moench.), fig. 109.—Erect evergreen shrub up to 4 feet high, with loose, widely spreading branches; leaves elliptic or

Fig. 109. Leatherleaf (*Chamaedaphne calyculata*).

40 Range Plant Handbook B 92: United States Department of Agriculture, Forest Service. Washington, D. C. 1937.

reverse-egg-shaped to lance-shaped, 1/2 to 2 inches long, rounded or blunt at tips, dull green above, rusty below; flowers white, borne on one side of slender erect leafy stems 2 to 5 inches long; capsules about 1/6 inch across, splitting into an inner and outer layer when ripe.

Occurrence.—ISLE ROYALE, abundant in the bogs: Mott Island.

DOWNY ANDROMEDA (*Andromeda glaucophylla* Link.), fig. 110.—Low evergreen shrub about 1 or up to 2 feet high with creeping root-stocks and erect stems; branches few; leaves oblong to linear, 2/3 to 1 2/3 inches long, the margins curled under from the sides, sometimes almost to the midribs, dark green above, white-woolly below; flowers white or pinkish, several in loose clusters at the ends of the stems; capsules somewhat turban-shaped, splitting down the backs of the cells. (Syn. *A. polifolia* L. var. *augustifolia* Ait.).

Occurrence.—ISLE ROYALE, common in the bogs: Mott Island; Scoville Point.

RUSTY MENZIESIA (*Menziesia ferruginea* Sm.), fig. 111.—Erect or straggling shrub, 2 to 8 feet high, with slender erect branches; leaves thinnish, 1 to 3 inches long, elliptic to reverse-egg-shaped, pointed at the tips, the margins very finely toothed, often covered above with scattered rusty hairs or nearly smooth, paler below, tending to be bunched towards the ends of the branches; flowers small, bell-shaped, white to dull yellowish or with a pinkish tinge, one to several on slender nodding stems in the leaf-axils near the ends of the branches; fruit an oblong capsule about 1/4 to 3/8 inch long, splitting from the top into 4 sections.

This is a common shrub in the parks of the Northwest and the Rocky Mountains, often forming

Fig. 110. Downy andromeda (*Andromeda glaucophylla*).

Fig. 111. Rusty menziesia (*Menziesia ferruginea*).

thickets in open woods or on moist hillsides. The scientific name, *Menziesia*, was given in honor of Archibald Menzies, one of the first botanists to visit Northwestern America, and who first discovered this plant. It has been called fool's huckleberry because the flowers and foliage closely resemble some of the western huckleberries (whortleberries or blueberries). It may be distinguished from these, however, by the leaves which tend to be bunched at the ends of the stems, by the long finely-hairy flower stems, and by the fruits which are small woody capsules. The shrub is also sometimes called skunkbush because of a mephitic odor given off from the freshly crushed foliage. It is reported to be poisonous to livestock when eaten in large quantities.[41] (Syn. *Menziesia glabella* Gray).

Occurrence.—OLYMPIC, 2,000 to 4,500 feet: Lake Crescent; Elwha River across from mouth of Buckinghorse Creek; Lake Margaret near Low Divide; northeast side of Anderson Pass. MOUNT RAINIER, abundant, 2,000 to 5,000 feet: Longmire; head of Narada Falls; Lake George. GLACIER, abundant, 3,500 feet to timberline: Lake McDonald; Logging Mountain; Bowman Lake; Kintla Lake; St. Mary Lake; Red Eagle Valley; Hudson Bay Creek trail; Cut Bank Valley; Two Medicine Valley; Swiftcurrent Lake; all trails around Many Glacier region. YELLOWSTONE. GRAND TETON, common, 6,500 to 8,300 feet: Cascade Canyon trail; Jenny Lake; Beaver Dick Lake.

MANZANITA, BEARBERRY (*Arctostaphylos* Adans.)

The manzanitas as a group are usually easily recognized because of the characteristic smooth dark-red bark, the often crooked stems, the thick leathery evergreen leaves, the waxy pink or white urn-shaped flowers, and the small fruits resembling tiny apples. The generic name is derived from the Greek *arktos* meaning bear, and *staphule* meaning bunch of grapes or berries. The common name, manzanita, is Spanish for little apple. The fruits are important as food for many birds and small mammals. They are also eaten by bears, hence the common name, bearberry. Indians of various regions ate the berries raw or used them dried and ground into pinole. Although the pulp is mealy and seedy, it has an agreeable acid flavor.

In many localities manzanitas are among the first plants to appear in burned-over areas. Some of the species are able to sprout from the root crown and thus quickly revive after a fire. Others, although completely killed by fire, are quick to become reestablished from seed after the hard outer shell has been cracked by the heat. Whether or not the plants crown-sprout after fire is frequently used as a character in determining the species. The foliage is mostly worthless as browse for animals because of the tough thick leaves. However, the young, tender shoots are sometimes eaten and a few of the species are of some value as winter feed for deer and mountain bighorn sheep.

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Plants erect, 3 to 10 feet high.

Branchlets and leaf-stems with long, white, spreading hairs; leaves hairy or nearly smooth (sometimes glandular), grayish-green, 1 to 2 inches long; plants of the parks of the Northwest .....1. *A. columbiana.*

41 Van Dersal, W. R., Native woody plants of the United States, p. 168. Washington, D. C. 1938.

Branchlets and leaf-stems without long spreading hairs, often finely hairy or sticky-glandular.

Flower stems more or less sticky-glandular.

Branchlets conspicuously glandular-hairy; berries very sticky-glandular; leaves whitish; common in Yosemite National Park .....2. *A. mariposa.*

Branchlets smooth, not conspicuously glandular-hairy or very finely so; berries smooth and glandular.

Leaves whitish; stems of flower-cluster all sticky-glandular; branchlets and leaf-stems mostly smooth, not glandular; berries sticky-glandular or smooth; common in Sequoia National Park .....3. *A. viscida.*

Leaves green; only the main stems and branches of flower clusters sticky-glandular; branchlets and leaf-stems mostly finely glandular-hairy; berry smooth .....4. *A. patula.*

Flower stems and branchlets not glandular, very finely whitish-fuzzy.

Leaves narrowly oblong to elliptic, sharp-pointed at the tip, ¾ to 1¼ inches long; very young flower-bud clusters short, ¼ to ½ inch long, stoutish, roundish to egg-shaped or club-shaped; occurs in parks of the Southwest .....5. *A. pungens.*

Leaves oblong to broadly elliptic or roundish, mostly rounded or blunt-pointed at the tips; 1 to 2 inches long; young flower-bud clusters slender, 1/3 to ⅜ inch long; occurs in California parks .....6. *A. mewukka.*

Plants with stems trailing along the ground; leaves bright green on both sides.

Leaves mostly pointed at the tips with a short sharp point; not so narrowly wedge-shaped at the base; berries often brownish-red; found in parks of the Pacific slope .....7. *A. nevadensis.*

Leaves mostly rounded or blunt at the tips, wedge-shaped at the base; berries bright red; wide-spread in Rocky Mountain and Northwest parks .....8. *A. uva-ursi.*

1. HAIRY MANZANITA (*Arctostaphylos columbiana* Piper.)—Shrub 2 to 10 feet high, much branched; young twigs densely covered with white, stiff hairs; leaves 1 to 2 inches long, grayish-green, hairy to nearly smooth, oblong-egg-shaped, pointed at the tip, the margin smooth or very finely toothed; flowers white, borne in short dense clusters at the ends of the stems, the flower stalks hairy, sometimes glandular hairy; berry flattish, about ¼ inch in diameter, light to deep chestnut brown; nutlets rough, distinct or more or less united. (Syn. *A. tomentosa* Lindl. as to the parks.)

Hairy manzanita is not common in the parks, although it occurs abundantly at lower elevations in the Pacific Northwest. The plants do not crown sprout but are killed completely by fire.

Occurrence.—OLYMPIC, occasional: 1½ miles southwest of Windfall Peak, 3,000 feet; trail to Constance Ridge. MOUNT RAINIER, occasional: lower Stevens Canyon; Ohanapecosh River.

2. MARIPOSA MANZANITA (*Arctostaphylos mariposa* Dudley).—Shrub 3 to 8 feet high with smooth dark reddish-brown bark; branchlets glandular-hairy (dusty looking in var. *bivisa*); leaves elliptic to roundish, usually with a short point at the tip, ¾ to 2 inches long, smooth and whitish; flowers light-

pink, borne in compact clusters at the ends of the branchlets; branches of flowering clusters sticky-glandular; berries globose, 1/4 to 1/3 inch in diameter, very sticky, becoming bright red (or whitish in var. *bivisa*); nutlets ridged on the back, distinct or some of them united.

Mariposa manzanita is very similar in appearance to whiteleaf manzanita, the most noticeable difference being in the branchlets which are very glandular-hairy in Mariposa manzanita and smooth or mostly without hairs or glands in whiteleaf manzanita. The bushes of both are very striking in appearance, the whitish leaves making quite a contrast to the reddish-brown stems. The plants do not sprout from the root crown.

A variety with whitish nutlets (var. *bivisa* Jepson) has been found at Hetch Hetchy and at Wawona in Yosemite National Park.

Occurrence.—YOSEMITE, abundant, 3,000 to 6,000 feet: western park boundary at Lake Eleanor; Hetch Hetchy Valley; Big Oak Flat road; El Portal; talus slopes on north side of Yosemite Valley; near foot of Yosemite Falls; Royal Arch Falls; south of Wawona. KINGS CANYON: switchbacks on Bubbs Creek trail.

3. WHITELEAF MANZANITA (*Arctostaphylos viscida*).—Same as for Mariposa manzanita except as noted above.

Occurrence.—SEQUOIA, common, 1,600 to 5,000 feet: Yucca Point, northwest corner of Park; Marble Fork Kaweah River; along General's Highway above Ash Mountain.

4. GREENLEAF MANZANITA (*Arctostaphylos patula* Greene), fig. 112. —Shrub 3 to 8 feet high, with crooked, widely spreading branches, the younger branchlets commonly very finely hairy and somewhat sticky; leaves 1 to 2 inches long, bright green, smooth, roundish to broadly elliptic, rounded or pointed at the tip; flowers pink, on smooth slender stalks 1/6 to 1/4 inch long, borne in dense flattish clusters towards the ends of the branches; berries light brown or black, smooth, roundish, 1/3 to 1/2 inch in diameter, often drying very hard; nutlets smooth, more or less united. (Syn. *A. platyphylla* (Gray) Kuntze.)

Fig. 112. Greenleaf manzanita (*Arctostaphylos patula*).

Greenleaf manzanita is one of the common manzanitas of the parks of the Southwest and of the Sierra Nevada Mountains of California, extending north to Crater Lake National Park in Oregon. It is one of the chief associates in ponderosa pine forests where it favors dry open slopes or old burns where the plants can obtain full sunlight. In areas where it occurs it is frequently the dominant species, often

covering wide areas. Branches forced to the ground by heavy snows may sometimes take root, forming large dense clumps. The ability of the plants to send up new shoots from the enlarged root-crown and thus to withstand repeated burnings may account partly for its abundance. Except for frequent fires, this species would easily become shaded out in many localities, especially by white fir. The young tender shoots and leaves are browsed to some extent by deer.

Occurrence.—CRATER LAKE, abundant in the ponderosa pine forests, 4,700 to 7,200 feet. LASSEN, common: Hot Springs Valley. YOSEMITE, abundant, 4,000 to 9,500 feet: western boundary of park near Eleanor Lake; near Aspen Valley; Big Oak Flat control road; Crane Creek, north of El Portal; Yosemite Valley; Merced Lake trail; Rainbow View; Glacier Point; near Wawona; Mariposa Grove. KINGS CANYON, up to 10,000 feet: near Sphinx Creek; between Junction and Charlotte Meadows; near East Lake. SEQUOIA, abundant, 2,200 to 9,000 feet: Kern Canyon near Junction Meadow; Bearpaw Mountain; Redwood Meadow ranger station; west of Little Baldy; south of Tar Gap on Hockett-Mineral King trail. BRYCE CANYON, common, 7,000 to 8,500 feet: near Bryce Lodge; Bryce Point; along the Rim Drive; Rainbow Point. ZION, common, especially on the plateau, 4,500 to 6,000 feet: Zion-Mount Carmel Highway near tunnel; Horse Pasture Plateau; West Rim trail near Angels Landing. GRAND CANYON, on the North Rim, 8,000 to 8,800 feet: Walhalla Plateau along road to Cape Royal; road to Point Imperial.

5. POINTLEAF MANZANITA (*Arctostaphylos pungens* H. B. K.).—Spreading shrub, 2 to 8 (or 10) feet high; the younger branches usually whitish with a fine close fuzz; leaves narrowly oblong to elliptic, pointed at the tip, ¾ to 1¼ inches long, thick and leathery, dull green or grayish above and below; flowers white, urn-shaped, borne in clusters towards the ends of the branches; berries roundish, smooth and shining, dark brown or brick color; nutlets ridged on the back, separate.

This and greenleaf manzanita are the most common species of manzanita in the Southwest, the pointleaf manzanita usually ranging at lower elevations than the greenleaf manzanita. The chief distinction between the two is in the leaves which are paler, narrower, and more pointed in the former species than in the latter. Also the very young flower clusters which appear late in the summer of the year preceding the blooming season are shorter and stouter in pointleaf manzanita. Those of greenleaf manzanita are rather slender. Under favorable conditions branches lying along the ground may take root.

Occurrence.—ZION, in the canyons, 4,000 to 5,000 feet: trail to Emerald Pools. GRAND CANYON, 4,200 to 8,250 feet. North Rim, at edge of rim: Bright Angel Point; McKinnon Point; Uncle Jim Point; Swamp Point. South Rim, rare: ¾ mile east of Yavapai Point. Canyon, north of the Colorado River: Kaibab Trail above Cottonwood Camp; above Roaring Springs.

6. INDIAN MANZANITA (*Arctostaphylos mewukka* Merr.).—Shrub 3 to 6 feet high; leaves pale green or whitish, elliptic to oblong, mostly pointed at the tips, 1 to 2 or 2½ inches long, smooth; flowers white, borne in loose, erect or somewhat drooping clusters; berries smooth, round, dull white or brownish, 1/3 to ½ or sometimes 2/3 inch in diameter; nutlets 4 or 5, sometimes united into a single stone. (Syn. *A. pastillosa* Jepson.)

Occurrence.—YOSEMITE: lower Merced Valley; Hetch Hetchy Valley; western

boundary of park near Eleanor Dam, 5,300 feet. SEQUOIA, common, 2,500 to 5,500 feet: Flapjack Creek, along road to Mineral King; old Colony Mill road to Giant Forest.

7. PINEMAT MANZANITA (*Arctostaphylos nevadensis* Gray).—This is a prostrate shrub very similar to kinnikinnick with its trailing stems often rooting where they touch the ground. The two plants may usually be distinguished by their leaves, those of bearberry being mostly rounded or blunt-pointed at the tips, while those of pinemat manzanita are mostly sharp-pointed. Pinemat manzanita occurs most commonly in pine forests of the parks of Washington and Oregon and in the Sierra Nevada parks of California. The erect branches of this species sometimes become 1 foot high. Bearberry is the prevailing species in the parks of the Rocky Mountains. It seldom grows over 6 inches in height. Both species commonly occur at high elevations, but the bearberry often extends down nearly to sea level on the Northwest coast.

Occurrence.—OLYMPIC. MOUNT RAINIER, common, 2,500 to 6,500 feet: Longmire Springs; head of Stevens Canyon; Crystal Lake trail; Ipsut Pass. CRATER LAKE, common, Union Peak, 6,000 feet. LASSEN, 7,000 to 8,000 feet: Mount Lassen; Flatiron Ridge; Manzanita Lake checking station; Manzanita Creek; trail to Bumpas Hell. YOSEMITE, common, 7,000 feet to timberline: Illilouette Falls; Cloud's Rest; Glacier Point; west of Mount Watkins; Gin Flat; Mount Dana; Ostrander Lake; Eagle Peak; Isberg Lake. SEQUOIA, common, 8,000 feet to timberline: ridge east of Panther Peak; trail from Eagle Lake to Mineral King.

8. BEARBERRY, KINNIKINNICK (*Arctostaphylos uva-ursi* (L.) Spreng.), fig. 113.—A prostrate or trailing evergreen shrub 6 to 12 inches high, with thin, shreddy, reddish-brown bark; leaves smooth, thick and leathery, light green, ½ to 1 inch long, with an untoothed margin, usually rounded or blunt-pointed at the tip; flowers small, waxy-white or pinkish, bell-shaped, borne in few-flowered clusters at the ends of the stems; berry round, red, smooth, the ripe pulp dry and mealy, with several hard seeds.

Bearberry is our most widely distributed manzanita and the only species found outside of western North America. It is found around the world in the northern regions. The plant is a low trailing shrub, often

Fig. 113. Bearberry (*Arctostaphylos uva-ursi*).

forming carpets in the forests. It is a pioneer in rocky barren areas and often one of the first to come into recently burned areas. The stems trailing along the ground help to hold the seeds of tree species and act as a protection to the seedlings until they become established. The common name, kinnikinnick, comes —from an Indian expression applied to a mixture of the dried leaves or bark of certain plants used with or in place of tobacco. This species was one of the plants most commonly used. The leaves are often browsed by deer and mountain sheep and many species of wild life are fond of the berries.

Occurrence.—OLYMPIC, occasional on rocky canyon sides and ridges, 2,000 to 6,000 feet: Elwha River Valley on lower slope of Mount Dana; Hurricane Ridge; summit of Mount Storm King; Constance Ridge; Mount Angeles. MOUNT RAINIER, occasional in rocky places, 5,000 to 8,000 feet. GLACIER, common, 3,000 to 8,000 feet: Kintla Lake trail to Boulder Pass; Bowman Lake; park headquarters at Belton; Lake McDonald; trail to Sperry Chalet; Avalanche Lake trail; Dry Fork Two Medicine Creek; Cut Bank Pass; below Cut Bank Chalet; Atlantic Creek valley below Triple Divide Pass; Mount Stimpson; Swiftcurrent Lake; Mount Altyn; Crossley Lake. YELLOWSTONE: Old Faithful; near Tower Falls; upper Geyser Basin; Mammoth Hot Springs. GRAND TETON. ROCKY MOUNTAIN, common on rocky ground, particularly in burned areas. ISLE ROYALE, common in rock openings: Mott Island.

WINTERGREEN (*Gaultheria* L.)

Except for one species, salal, which is found in the Pacific Northwest, the species of *Gaultheria* are small prostrate or trailing plants only a few inches high. These small species, commonly known as wintergreen, have an aromatic fragrance to the herbage and berries. The eastern species has been used to furnish some of the commercial "oil of wintergreen" used in flavoring and medicine. The fruits are interesting and unique in that the calyx becomes enlarged and colored in fruit, forming part of a fleshy berry. These furnish food for birds and small mammals.

FIELD GUIDE TO THE SPECIES

Conspicuous shrubs 1 to 6 feet high; flowers borne along slender stems near the ends of branches; berries purple ..... 1. *G. shallon.*

Small trailing or prostrate herb-like plants 1 to 8 inches high; flowers borne singly in the leaf axils; berries red.

Corolla urn-shaped, short-lobed; anthers of stamens with awns; eastern species ..... 2. *G. procumbens.*

Corolla bell-shaped, deeply lobed; anthers without awns; western species.

Matted shrub up to about 4 inches high; leaves to about ¾ inch long; corolla slightly longer than calyx ..... 3. *G. humifusa.*

Loosely spreading shrub up to 8 inches high; leaves to about 1½ inches long; corolla much longer than calyx ..... 4. *G. ovatifolia.*

1. SALAL (*Gaultheria shallon* Pursh), fig. 114.—Evergreen shrub, commonly 1 to 6 (or 10) feet high, with erect or spreading branches; leaves egg-shaped, with a rounded base and pointed tip, 1 to 4 inches long, thick, glossy, the margins finely toothed; flowering stems 3 to 6 inches long, the flowers bell-shaped, white or pinkish, 1/3 to ½ inch long, borne on short stalks curved towards one side of an unbranched stem; berries dark-purple

or nearly black, juicy, with many tiny seeds.

Salal is a common shrub in the lowland woods of the Pacific Northwest. It grows in moist, shaded Douglas fir and Sitka spruce forests or sometimes in drier locations along with the holly-grape, huckleberries or other shrubs. The species name, *shallon,* and the common name, salal, are derived from the Indian name of the plant which the early explorers understood as sallon, shalal, or shallon.[42] The plant is ordinarily about 3 feet tall but along the coast in the northern end of its range it may form extensive thickets 6 or more feet high. The berries are of good flavor. They were eaten raw by the Indians of the Northwest and used to flavor soups. Local residents often gathered them for making jelly. Deer and elk browse the herbage, especially during the winter.

Fig. 114. Salal (*Gaultheria shallon*).

Occurrence.—OLYMPIC, abundant at the lower elevations; Elwha River, above mouth of Lost River; Mount Angeles. MOUNT RAINIER, abundant, 2,000 to 4,500 feet: Kautz Creek; between Longmire and Paradise Park.

2. CHECKERBERRY WINTERGREEN (*Gaultheria procumbens* L.).—Small evergreen plants with stems creeping below the ground and erect flowering branches up to about 6 inches high; herbage aromatic; leaves oval to reverse-egg-shaped, 2/3 to 1½ inches long, blunt-pointed, bright green above, smooth; flowers white or slightly pinkish, nodding from the axils of the leaves; berries nearly globose, ¼ to 2/3 inch in diameter, dark red.

Occurrence.—ISLE ROYALE, occasional: trail to Mount Franklin; north side of Angleworm Lake; northwest of Hay Bay.

3. WESTERN WINTERGREEN (*Gaultheria humifusa* (Graham) Rydb.—A small prostrate evergreen shrub 1 to 4 inches high; leaves ¼ to ¾ inch long, oval to egg-shaped or somewhat roundish, rounded or blunt-pointed at the tip, the margin scarcely toothed; flowers small, white, bell-shaped, borne singly on short stalks in the leaf-axils; berries bright red, small, globose, with a sweet flavor.

Occurrence.—OLYMPIC: Deer Lake; Anderson Pass just above shelter, 4,400 feet. MOUNT RAINIER. CRATER LAKE, rare: upper Annie Creek; Boundary Spring. YOSEMITE: Gaylor Lakes; Elizabeth Lake; Young Lake; Snow Flat. KINGS CANYON: Granite Basin, Kings River. SEQUOIA: Long Lake in Little Five Lakes Basin. GLACIER, occasional in meadows above timberline, 6,000 to 7,500 feet: Iceberg Lake;

42 Range Plant Handbook B 83: United States Department of Agriculture, Forest service, Washington, D. C. 1937.

Granite Park; Sexton Glacier, below Siyeh Pass; near Logan Pass. YELLOWSTONE, common: Burning Mountain; Frying Pan. GRAND TETON. ROCKY MOUNTAIN, rare in damp places at higher elevations.

4. OREGON WINTERGREEN (*Gaultheria ovatifolia* Gray).—Low, herb-like trailing plant, 2 to 8 inches high; stems and leaf-stalks more or less hairy; leaf-blades oval to egg-shaped or roundish-egg-shaped, 1/2 to 1 1/2 inches long, pointed at the tips, the margin finely toothed; flowers small, white, bell-shaped, borne singly; berries globose, red, sweet.

Occurrence.—OLYMPIC: Mount Angeles; Elk Lake, 2,500 feet; Canyon Creek. MOUNT RAINIER, occasional in open woods, 3,000 to 4,500 feet: Cowlitz River south of Canyon Bridge. CRATER LAKE: south of boundary spring, northwest corner of park; Whiskey Creek, near west entrance.

Fig. 115. Creeping pearlberry (*Chiogenes hispidula*).

CREEPING PEARLBERRY (*Chiogenes hispidula* T. & G.), fig. 115.—Evergreen trailing plant with slender slightly woody stems; leaves alternate, small, mostly less than 3/8 inch long, egg-shaped, the lower surface and the stems covered with stiff rusty bristles closely appressed to the surface; flowers white, small, with deeply 4-cleft corollas, borne singly on very short stems in the axils of the leaves; berries white, crowned by 4 calyx teeth, about 1/4 inch in diameter, many-seeded. The herbage has aromatic flavor similar to that of wintergreen.

Occurrence.—ISLE ROYALE, common in bogs and moist forests: Mott Island; Washington Harbor along trail to Windigo Mine.

BLUEBERRY, BILBERRY, WHORTLEBERRY, CRANBERRY (*Vaccinium* L.)

There are many species of *Vaccinium* in our national parks, found mostly in the more northern parks where they are among the most sought after of all the wild berries. Most of the species bear an abundance of sweet berries delicious in pies or when eaten fresh. Many are collected each year by local residents for preserving or jelly. Bears and small mammals are also fond of them. In certain localities many of the species have been commonly called huckleberry but this is the name given to an eastern genus, *Gaylussacia,* which is very similar to *Vaccinium* except that its berries have hard stony seeds. The fruits of *Vaccinium* have numerous tiny seeds.

The herbage of most of the species furnish valuable browse for wild life. The foliage of the evergreen species found on the Pacific coast provides beautiful greenery and is often planted as an ornamental. Among the evergreen species are the small trailing cranberry plants which grow in sphagnum bogs

of the northern states, including the species from which we obtain our commercial cranberries. The cranberries are grouped by some botanists into a separate genus, *Oxycoccus,* since the plants are in many ways so different from the other species of *Vaccinium.* The common name comes from cranberry because the flower and its stem are fancied to resemble the head and neck of a crane.

FIELD GUIDE TO THE SPECIES

Evergreen shrubs; leaves thick and leathery, smooth and dark green above.
- Slender trailing shrubs; leaves 1/4 to 5/8 inch long; corolla deeply divided into 4 petal-like lobes.
  - Flowers borne on erect or ascending branchlets with a long leafy shoot above the flower cluster; berries 3/8 to 3/4 in in diameter; stems rather coarse ..... 1. *V. macrocarpon.*
  - Flowers borne near the ends of the branchlets; berries 1/4 to 3/8 inch in diameter ..... 2. *V. oxycoccus.*
- Erect or spreading shrubs 3 to 8 feet high; corolla bell-shaped; Pacific coast species ..... 3. *V. ovatum.*

Deciduous shrubs; leaves mostly dull green and thinnish.
- Flowers borne in clusters at the ends of the branches; low shrubs.
  - Stems and leaves softly hairy all over ..... 4. *V. canadense.*
  - Herbage smooth, or sometimes the leaves hairy below.
    - Leaves green on both sides, finely toothed ..... 5. *V. angustifolium.*
    - Leaves whitish at least below, mostly not toothed ..... 6. *V. pallidum.*
- Flowers borne singly (or sometimes 2 or 3 together); low or tall shrubs.
  - Branchlets rounded, not angled; leaves tapering to a wedge-shaped base.
    - Corollas mostly 4-lobed; leaves not toothed.
      - Shrubs to 1 1/2 feet high; leaves oval to reverse-egg-shaped; eastern species ..... 7. *V. uliginosum.*
      - Shrubs to 3 feet high; leaves narrowly reverse-egg-shaped to reverse-lance-shaped; western species ..... 8. *V. occidentale.*
    - Corollas 5-lobed; leaves finely toothed.
      - Leaves reverse-egg-shaped to reverse-lance-shaped, green on both sides; corolla ellipsoid; berries 1/4 inch in diameter ..... 9. *V. caespitosum.*
      - Leaves oval to reverse-egg-shaped, pale or whitish below; corolla nearly globose; berries to about 3/8 inch in diameter ..... 10. *V. deliciosum.*
  - Branchlets more or less angled; leaves not wedge-shaped at base.
    - Low plants 3 to 8 inches high; leaves small, not more than 3/4 inch long.
      - Leaves oblong to narrowly egg-shaped, 1/4 to 1/2 inch long; berries red, about 1/8 inch in diameter ..... 11. *V. scoparium.*
      - Leaves oval to egg-shaped, 1/2 to 3/4 inch long; berries about 3/16 inch in diameter, dark red to purplish-black with a bloom ..... 12. *V. oreophilum.*
    - Plants taller, 1 to 10 feet high; leaves mostly more than 3/4 inch long, if smaller then the shrubs at least 3 feet high.
      - Rather tall shrubs with widely spreading branches; leaves oval to oblong egg-shaped, rounded or blunt-pointed at tips, not toothed or rarely few-toothed; berries globose.

Leaves 1/4 to 1 1/4 inches long, light yellowish-green; berries red ..... 13. *V. parvifolium.*

Leaves 3/4 to 2 inches long, bluish-green; berries dark-blue with a bloom ..... 14. *V. ovalifolium.*

Low or tall shrubs with ascending branches; leaves oval to egg-shaped or reverse-egg-shaped, mostly pointed at the tips, the margins finely toothed; berries flattened-globose, red-purple to black, with or without a bloom ..... 15. *V. membranaceum.*

Fig. 116. Cranberry (*Vaccinium macrocarpon*).

1. CRANBERRY (*Vaccinium macrocarpon* Ait.), fig. 116. — Trailing or creeping evergreen plants with slender more or less woody stems; leaves narrowly elliptic to oblong, 1/4 to 3/4 inch long, thickish, dark green above, whitish below, often curled under at the edges; flowers pink, the corolla divided into 4 spreading linear-oblong lobes 1/4 to 3/8 inch long, borne in clusters of several on short erect leafy branchlets, these with a leafy shoot extending beyond and above the flower-cluster; berries globose to oblong, 3/8 to 3/4 inch in diameter, dark red. (Syn. *Oxycoccus macrocarpus* Pers.).

Occurrence.—ISLE ROYALE, widespread in bogs: head of Rock Harbor near start of Lake Richie trail; Forbes Lake; Sumner Lake.

2. SMALL CRANBERRY (*Vaccinium oxycoccus* L.), fig. 117.—Similar to *V. macrocarpon* but the stems more slender; leaves 3/16 to 3/8 inch long, egg-shaped to oblong-egg-shaped, the margins strongly curled under; flowers smaller, the petal-like lobes not more than 1/4 inch long, borne in clusters of 1 to 4 at the ends of the branchlets, without a leafy shoot extending above the flower-cluster; berries globose or somewhat pear-shaped, 1/4 to 3/8 inch in diameter, dark red.

A somewhat coarser variety, Western small cranberry (var. *intermedium* Gray), with leaves up to 5/8 inch long, and with more

Fig. 117. Small cranberry (*Vaccinium oxycoccus*).

flowers in the cluster, often 8 to 10, is found also with the species.

Occurrence.—ISLE ROYALE, widespread in bogs: Mott Island; near Lake Desor.

3. BOX BLUEBERRY, CALIFORNIA HUCKLEBERRY (*Vaccinium ovatum* Pursh).—Spreading evergreen shrub 3 to 8 feet high; leaves oblong to elliptic, pointed at the tips, ½ to 1 inch long, thick and leathery, dark green and shining above, paler below, the margins toothed; flowers white or pink, the corolla 5-lobed, borne in small clusters in the leaf axils; berries ovoid, ¼ to ⅜ inch long, bluish-black with a bloom. The luxuriant shiny evergreen leaves make this shrub beautiful for greenery and it is often planted as an ornamental.

Occurrence.—OLYMPIC, common outside of park and probably occurs within the park boundaries. MOUNT RAINIER, rare in the park but common west of park boundaries.

4. CANADA BLUEBERRY (*Vaccinium canadense* Kalm.).—Low shrub ½ to 2 feet high, the herbage softly hairy; leaves elliptic to oblong, somewhat pointed at both ends, ¾ to 1¼ inches long; flowers pinkish, borne in several-flowered clusters at the ends of the stems; berries globose, about ⅛ to ¼ inch in diameter, dark purple-blue with a bloom. This is an eastern species which comes as far west as Montana.

Occurrence.—GLACIER, occasional at low elevations on the west side, 3,100 feet: park headquarters at Belton; along Flathead River below Apgar lookout. ISLE ROYALE, common in rock openings in the forest: Mott Island; Lake Richie trail; Washington Harbor.

5. LOWBUSH BLUEBERRY (*Vaccinium angustifolium* Ait.), fig. 118.—Low shrubs about ½ to 2 feet high; leaves lance-shaped, ½ to 1 inch long, pointed at both ends, the margins finely toothed, green and smooth on both sides; flowers greenish-white, borne in short dense clusters at the ends of the branches; berries black with a whitish bloom, ¼ to ½ inch in diameter. (Syn. *V. pennsylvanicum* Lam.).

Occurrence.—ISLE ROYALE, common in rock openings: Mott Island; Old Siskiwit Mine; Lake Richie trail; Sumner Lake.

Fig. 118. Lowbush blueberry (*Vaccinium angustifolium*).

6. BLUERIDGE BLUEBERRY (*Vaccinium pallidum* Ait. var. *crinatum* Fern.).—Low shrub up to 2 or 3 feet high with yellowish-green branchlets;

leaves oval to egg-shaped, 1 to 2 inches long, pointed at the tips, dull green above, whitish below, smooth at least above; flowers white or tinged with red, the calyx usually reddish; berries blue with a bloom, about 1/4 inch in diameter. (Syn. *V. vacillans* Kalm. var. *crinatum* Fern.)

Occurrence.—ISLE ROYALE: Rock Harbor; Scoville Point.

Fig. 119. Bog bilberry (*Vaccinium uliginosum*).

7. BOG BILBERRY (*Vaccinium uliginosum* L.), fig. 119.—Low shrub up to about 1 1/2 feet high, the branches smooth or slightly hairy, not angled; leaves oval to reverse-egg-shaped, 3/8 to 1 inch long, pale or whitish on both sides, slightly hairy below; flowers white or pink, borne singly or in groups of 2 or 3; berries blue-black with a bloom, 1/4 inch in diameter, sweet.

Occurrence.—ISLE ROYALE, common in rock crevices and along margins of rock pools: Mott Island; Scoville Point.

8. WESTERN BOG BLUEBERRY (*Vaccinium occidentale* Gray).—Compact shrub 1 to 3 feet high; leaves oblong to narrowly wedge-shaped, not toothed, more or less pointed at the tips, 1/2 to 1 inch long, green above, paler below; flowers white, small, narrowly bell-shaped, borne singly or in groups of 2 to 4; berries 1/4 inch or less in diameter, blue-black with a bloom, sweet but with a slightly bitter quality. The foliage is browsed to a considerable extent by deer, especially late in the season.

Occurrence.—MOUNT RAINIER. CRATER LAKE, common on west side of park: near Annie Spring; Boundary Spring, western park boundary. LASSEN: Long Lake. YOSEMITE, 6,000 to 9,600 feet: Lyell Fork, Tuolumne River; Clark Creek; Tuolumne Meadows; lake on Matterhorn Canyon rim; Mount Lyell. KINGS CANYON: Reflection Lake; General Grant Grove. SEQUOIA: Giant Forest; Clover Creek pasture. YELLOWSTONE, common: 1/2 mile north of Chocolate Pot, south of Norris; Gibbon River; Lone Star Geyser. GRAND TETON.

9. DWARF BLUEBERRY (*Vaccinium caespitosum* Michx.).—Low spreading shrubs 2 to 12 inches high; branchlets scarcely if at all angled; leaves 1/2 to 1 inch long, oblong-wedge-shaped, rounded or blunt-pointed at the tips, the margins very finely toothed to not toothed; flowers white or pinkish, small, ovoid, borne singly on slender nodding stems in the leaf-axils; berries globose, about 1/4 inch in diameter, bluish-black with a bloom, sweet and juicy. The foliage takes on a dark red coloration in late Summer or Fall, often forming conspicuous red patches on open hillsides. (Syn. *V. caespitosum* var. *cuneifolium* Nutt.).

Occurrence.—OLYMPIC: Hoh River; Home Sweet Home Camp. MOUNT RAINIER: Eunice Lake. CRATER LAKE, common, 5,500 to 7,000 feet: Castlecrest Gardens; Annie

Spring; Vidae Falls; Pole Bridge; Wheeler Creek. LASSEN: Long Lake; Dersch Meadows. YOSEMITE: Lyell Fork Tuolumne River; Crescent Lake; Tuolumne Meadows; Donohue Pass; Mount Dana. KINGS CANYON: Harrison Pass trail. SEQUOIA, occasional, 7,000 to 11,000 feet: Hockett Meadow; northeast of Pear Lake; Big Arroyo-Kern Divide. GLACIER, common: Belton, near park headquarters; Kintla Lake road. ROCKY MOUNTAIN, occasional on the west side.

10. DELICIOUS BLUEBERRY (*Vaccinium deliciosum* Piper).—Low shrub 4 to 12 inches high, the branches practically round; leaves 2/3 to 1½ inches long, pale green or whitish, reverse-egg-shaped to elliptic, mostly blunt-pointed, the margins finely toothed; flowers pinkish, somewhat globose; berries usually globose, ¼ to ⅜ inch in diameter, bluish-black with a bloom, sweet and juicy. This is the common species in the mountain parks and alpine meadows of the Northwest. It is a favorite with local residents for blueberry pies.

Occurrence.—OLYMPIC, abundant, 3,500 to 5,000 feet: Low Divide; Anderson Pass; Marmot Lake; Home Sweet Home camp; Seven Lakes Basin; Deer Lake. MOUNT RAINIER, abundant, 4,000 to 6,000 feet: Eunice Lake; west of Windy Gap; Seattle Park; Paradise Valley; trail to Reflection Lake.

11. GROUSE WHORTLEBERRY (*Vaccinium scoparium* Leib.), fig. 120.—Low shrub 4 to 8 inches high; branches bright green, angled, erect, densely clustered and broom-like; leaves small, ¼ to ½ inch long, oblong to narrowly egg-shaped, the margins usually very finely toothed; flowers small, white or pinkish, nodding on short stems in the leaf-axils; berries small, about ⅛ inch in diameter, bright red, sometimes drying dark reddish-purple, rather tart and agreeable. (Syn. *V. microphyllum* Rydb.).

Fig. 120. Grouse whortleberry (*Vaccinium scoparium*).

Occurrence.—MOUNT RAINIER, common, 4,000 to 5,000 feet: Ohanapecosh Hot Springs; Mowich Lake trail to Eunice Lake. CRATER LAKE, common, 5,500 to 6,500 feet: northeast of Union Peak; Annie Spring; park headquarters; the Pinnacles; Boundary Spring. GLACIER, occasional, 3,100 to 6,500 feet: North Fork Flathead River road near Lake McDonald; Mount Brown trail; Cut Bank Valley; above Lake Ellen Wilson. YELLOWSTONE, common: east of Cub Creek camp; east entrance road;

south of Beryl Spring, south of Norris; West Thumb; road between Old Faithful and Thumb. GRAND TETON: two miles east of Eagles Rest. ROCKY MOUNTAIN, common, 10,000 to 11,000 feet: 1/4 mile southeast of Dream Lake.

12. ROCKY MOUNTAIN WHORTLEBERRY (*Vaccinium oreophilum* Rydb.). —Low spreading shrub, 3 to 12 inches high with slender, green, angled branches; leaves thin, oval to egg-shaped, 1/2 to 3/4 inch long, the margins usually very finely toothed; flowers pinkish-white, bell-shaped, borne singly in the upper leaf-axils; berries nodding, about 3/16 inch in diameter, at first red, becoming purple-black with a bloom. (Syn. *Vaccinium myrtillus* as to Rocky Mountain plants, not L.).

Occurrence. — GLACIER, common, 3,100 to 7,200 feet: Belton; Logan Pass; Logging Lake; North Fork Flathead River road; Swiftcurrent Lake; above Kintla Lake; Cut Bank Valley; trail from Crossley Lake to Indian Pass. ROCKY MOUNTAIN, common.

Fig. 121. Red whortleberry (*Vaccinium parvifolium*).

13. RED WHORTLEBERRY (*Vaccinium parvifolium* Smith), fig. 121. — Slender, spreading shrub 3 to 12 feet high with somewhat zigzag branches forming more or less horizontal sprays; herbage yellow-green, the stems sharply angled; leaves mostly oval with blunt points, 1/4 to 1 1/4 inches long, untoothed; flowers white or pinkish, bell-shaped, borne singly on slender stems in the leaf-axils; berries bright red, about 1/4 to 1/3 inch in diameter, juicy, tart and agreeable, often collected for canning and preserving. The foliage is browsed by deer and elk.

Occurrence.—OLYMPIC, common in the lower forests: Elwha River Valley; Lake Crescent. MOUNT RAINIER, abundant, 1,750 to 4,000 feet: Carbon River near ranger cabin; Ohanapecosh Hot Springs; Puyallup River. YOSEMITE, rare: North Crane Creek, 5,700 feet.

14. OVAL-LEAF WHORTLEBERRY (*Vaccinium ovalifolium* Smith). — Erect shrub 3 to 6 feet high with spreading branches forming open flattish sprays; branchlets somewhat angled; foliage bluish-green; leaves oval to oblong or narrowly egg-shaped with rounded or blunt-pointed tips, 3/4 to nearly 2 inches long; flowers pinkish, bell-shaped, borne singly on slender nodding

stems; berries globose, about 1/4 to 1/3 inch in daimeter, dark blue with a bloom.

This is common as an understory shrub in the lower forests of the Northwest, often in association with red whortleberry. The foliage is browsed to some extent and the fruits are relished by birds and small mammals. The berries are gathered in considerable quantities by local residents and used for canning. The rather strong acid flavor makes them especially good for jelly.

Occurrence.—OLYMPIC, abundant, up to about 4,000 feet: Hoh River near Olympus Guard Station; Elk Lake; Elwha River; Deer Lake; northeast side of Anderson Pass. MOUNT RAINIER, abundant, 2,000 to 4,500 feet: top of Narada Falls; Nisqually Valley; Carbon River near ranger cabin; Ohanapecosh Hot Springs.

A form with leaves more pointed, sometimes few-toothed, and the berries purple-black, sometimes without a bloom, is found in Olympic National Park. It answers the description of *Vaccinium oblatum* Henry which has been recorded from Vancouver, British Columbia.

Fig. 122. Big whortleberry (*Vaccinium membranaceum*).

15. BIG WHORTLEBERRY (*Vaccinium membranaceum* Dougl.), fig. 122.—Bushy shrub 2 to 6 feet high with ascending branches; leaves reverse-egg-shaped, mostly pointed at the tips, 1 to 2 inches long, the margins finely toothed, green on both sides; flowers globe-shaped, greenish-white or pinkish; berries flattened-globose, large, sometimes 1/2 inch in diameter, dark wine-red to purple-black, shiny, mostly without a bloom, the calyx forming a conspicuous flange at the top. The sweet juicy berries are delicious in pies or when eaten fresh with sugar and cream. In places where the bushes are abundant the berries are gathered by local residents for the market. It is said that for this fruit the Klamath Indians used to make an annual pilgrimage to Huckleberry Mountain southwest of Crater Lake.[43] The foliage is browsed by deer to a certain extent. (Syn. *V. macrophyllum* Piper.)

Occurrence.—OLYMPIC, common, 3,200 to 5,000 feet: Mount Angeles; North Fork Quinault River trail below Low Divide; Low Divide below Mount Seattle; Olympic Hot Springs; Boulder Creek; near shelter north of Anderson Pass. MOUNT RAINIER, common, 4,000 to 5,500 feet: head of Stevens Canyon; Ipsut Pass near Mowich Lake.

43 Coville, F. V., The August vegetation of Mount Mazama: Mazama vol. 1, no. 2, p. 196. 1897.

CRATER LAKE, common, 5,000 to 6,500 feet: near park headquarters. GLACIER, abundant, 3,100 to 6,500 feet: Belton, near park headquarters; above Lake Ellen Wilson; trail to Trout Lake above Lake McDonald; Going-to-the-Sun Highway below the hairpin turn; Cut Bank Valley; above St. Mary Lake; trail above Elizabeth Lake. YELLOWSTONE: West Thumb. GRAND TETON: Jackson Lake; near mouth of Death Canyon.

The low form usually less than two feet high found in Rocky Mountain parks has been described as *Vaccinium globulare* Rydb. It differs from *V. membranaceum* in having smaller leaves, 5/8 to 1¼ inches long, usually pale below, the berries smaller, globose, purple-black, usually with a bloom. Although the extremes are quite distinct, in places where both forms occur it is difficult to draw the line between them.

Crowberry Family (Empetraceae)

BLACK CROWBERRY, WINEBERRY (*Empetrum nigrum* L.).—Low creeping evergreen shrub with prostrate stems 6 to 15 inches long and numerous spreading branchlets; leaves crowded on the stems, linear, blunt-pointed, grooved on the lower side; flowers small, mostly with 3 sepals and petals, borne singly in the leaf-axils; berries small, black, containing 6 to 9 seeds or nutlets.

The generic name, *Empetrum*, comes from the Greek *en*, upon, and *petros*, rock, alluding to the fact that it is often found growing on rocks, over which it may form dense clinging carpets. The tiny black berries are eaten by birds.

Occurrence.—OLYMPIC: moraine at edge of Blue Glacier, 4,000 feet. MOUNT RAINIER, common at about 7,500 feet. ISLE ROYALE, occasional on rocks: Scoville Point; Passage Island.

Olive Family (Oleaceae)

Field Guide to the Genera

Fruits seed-like with prominent wing at the tip, borne in loose drooping clusters ..... FRAXINUS, p. 204.

Fruits not winged, borne singly or in groups of several.

Small shrubs up to about 1 foot high; leaves mostly linear or lance-shaped, about ½ inch long, the lower broader and larger; fruits small capsules ..... MENODORA, p. 206.

Large shrubs up to 5 or 10 feet high; leaves reverse-egg-shaped or egg-shaped to lance-shaped, mostly more than ½ inch long; fruits like small olives ..... FORESTIERA, p. 206.

Ash (*Fraxinus* L.)

Ash is well known as large trees usually found growing along streams and in generally wet places. The shrub species found in our national parks have a rather different appearance but can be identified as species of ash because of their narrow wedge-shaped winged fruits hanging in loose clusters.

Field Guide to the Species

Leaves divided into 3 to 5 separate leaflets; flowers with white or greenish-white corollas.

Leaflets toothed; flower clusters leafless, borne in axils of the leaves; corolla composed of 2 narrow petals; found in California parks ..... 1. *F. dipetala.*

Leaflets mostly not toothed; flower clusters terminal on leafy shoots; corolla divided into 4 linear lobes; found in the Grand Canyon ..... 2. *F. cuspidata* var. *macropetala.*

Leaves mostly not divided into separate leaflets; flowers green, the petals none ..... 3. *F. anomala.*

1. TWO-PETAL ASH (*Fraxinus dipetala* H. & A.).—Spreading shrub 5 to 25 feet high with numerous slender stems from the base; leaves opposite, divided into usually 5 leaflets; leaflets ¾ to 1½ inches long, broadly elliptic to egg-shaped, the margins toothed; flowers white, the petals 2, about ¼ inch long, borne in narrow clusters 2 to 4 inches long, the clusters usually several in the leaf-axils; fruits small winged seeds ¾ to 1 inch long, the wings oblong, sometimes notched at the tips. This species occurs principally in canyons or on mountain slopes in the foothill regions of California where it is also known as flowering ash. The herbage is browsed by deer.

Occurrence.—YOSEMITE, rare near western park boundary: El Portal, 2,500 feet. SEQUOIA, occasional: west of Panorama Point, 3,000 feet.

2. SOUTHWESTERN FRAGRANT ASH (*Fraxinus cuspidata* Torr. var. *macropetala* (Eastw.) Rehd.), fig. 123.—Tall spreading shrub with ash-colored bark; leaflets 3 to 5, egg-shaped to oval or roundish, ½ to 1¼ inches long, the terminal leaflet often larger than the lateral, mostly not toothed; flowers fragrant, borne in loosely branched clusters at the ends of leafy branchlets, the clusters erect in flower, drooping in fruit; corolla about ½ inch long, divided into 4 linear lobes, green at first, becoming white; fruits narrowly oblong, ¾ to 1 inch long. (Syn. *F. macropetala* Eastw.).

Occurrence.—GRAND CANYON, in the canyon, on the redwall limestone formation on both sides of the Colorado River, 4,500 to 6,000 feet: Bright Angel trail; below Huxley Terrace; Kaibab trail above Devil's Backyard.

Fig. 123. Southwestern fragrant ash (*Fraxinus cuspidata* var. *macropetala*).

3. SINGLELEAF ASH (*Fraxinus anomala* Wats.), fig. 124.—Shrub or small tree 5 to 30 feet high, the branchlets 4-sided; leaf-blades roundish to broadly egg-shaped with broad wedge-shaped base, ¾ to 2 inches long, sometimes divided into 3 leaflets, dark green, smooth, somewhat leathery, not toothed or with few coarse teeth; flowers green, borne in clusters in the leaf-

Fig. 124. Singleleaf ash (*Fraxinus anomala*).

axils, the petals none; fruits oblong, 1/2 to 3/4 inch long. The herbage is browsed to a certain extent by animals.

Occurrence. — ZION, occasional: road below Temple of Sinawaya. GRAND CANYON, 4,400 to 6,700 feet. South Rim, rare: between Yaki Point and Shoshone Point; Grandview trail. Canyon, common: Bright Angel trail; Hermit trail; Havasu Canyon; Bright Angel Canyon; Kaibab trail above Roaring Springs.

ROUGH MENODORA (*Menodora scabra* Gray).—Low herb-like shrubs 1/2 to 1 (or 2) feet high, with numerous slender stems clustered at the woody base; leaves somewhat leathery, sparsely hairy, alternate or the lower opposite, not toothed, oblong- to linear-lance-shaped, about 1/2 inch long or the lower larger and broader, up to about 1 1/2 inches long; flowers yellow, the corolla with short tube and 5 oblong spreading lobes; fruits small 2-lobed capsules, the cells ovoid to globose, each 2-seeded.

Occurrence. — GRAND CANYON, rare on the South Rim: Pasture Wash.

NEW MEXICAN FORESTIERA, PALOBLANCO (*Forestiera neomexicana* Gray).—Much-branched shrub 5 to 10 feet high with opposite leaves and often spine-tipped branchlets; bark smooth, grayish or yellowish; leaves grayish-green, reverse-lance-shaped to narrowly egg-shaped, tapering to a point at the base, usually not more than twice as long as wide, 1/2 to 1 1/2 inches long, smooth, the margins finely toothed, often tending to be clustered at the ends of the branches; flowers small and inconspicuous, greenish-yellow, clustered along the stems before the leaves appear; petals none, or rarely 1 or 2, white; fruits oblong, 1/4 to 1/3 inch long, bluish-black when ripe, 1-seeded, borne on slender stems in clusters of few to several in the leaf-axils.

Occurrence.—MESA VERDE, occasional: north-facing slopes of Long Canyon near junction with Navajo Canyon.

PHACELIA FAMILY (Hydrophyllaceae)

YERBA-SANTA (*Eriodictyon* Benth.)[44]

The generic name, *Eriodictyon,* is from the Greek, *erion,* wool, and *dic-*

44 A very showy species, *Eriodictyon Parryi* (Gray) Greene (Syn. *Nama Parryi* Gray), is found at Horseshoe Bend along the entrance highway to Kings Canyon National Park.

tuon, network, referring to the dense felt covering the lower surface of the leaves between the very prominent net-work of veins.

FIELD GUIDE TO THE SPECIES

Herbage white-woolly; leaves not glutinous above; flowers in dense, leafy, more or less head-like clusters ..... 1. *E. Lobbi.*

Herbage not white-woolly; leaves more or less glutinous above; flowers in branched spreading clusters, the clusters with few leaves.

Leaves oblong to lance-shaped, 2 to 8 inches long, the margins very slightly, if at all, inrolled; occurs in California parks ..... 2. *E. californicum.*

Leaves linear, 1 to 4 inches long, the margins conspicuously inrolled; occurs in the Southwest parks ..... 3. *E. angustifolium.*

1. WOOLLY YERBA-SANTA (*Eriodictyon Lobbi* (Gray) Greene).—Low spreading shrub, ½ to 1½ feet high, the stems creeping or somewhat erect; lower leaves ¾ to 1 inch long, linear or narrowly spatula-shaped, white-woolly at least below, the margins more or less inrolled, crowded and bunched along the stems; leaves of flowering stems 1 to 2 inches long, spatula-shaped, scattered on the stems; flowers purple, tubular, about 1/3 to ½ inch long, borne in clusters of a few in the axils of the upper leaves; fruits tiny capsules splitting into 4 sections. (Syn. *Nama Lobbi* Gray).

Occurrence.—LASSEN: Lassen Peak.

2. CALIFORNIA YERBA-SANTA (*Eriodictyon californicum* H. & A. Greene).—Erect evergreen shrub 2 to 8 feet high; leaves oblong to lance-shaped, 2 to 8 inches long, smooth and usually somewhat sticky or varnished-looking above, densely grayish-felty below, the margins shallowly toothed and sometimes slightly inrolled; flowers with tubular corollas, ⅜ to ⅝ inch long, blue to lavender or almost white; fruits small hard capsules about ⅛ inch long, splitting into 4 sections.

California yerba-santa is considered a valuable honey plant for bees and the herbage is browsed to a certain extent by deer. Early settlers considered the crushed leaves as helpful in treatment of colds, catarrh, and asthma.

Occurrence.—YOSEMITE, occasional, 2,500 to 5,000 feet: west entrance to park; Mirror Lake; Wawona. SEQUOIA, occasional, 2,000 to 6,000 feet: Giant Forest; Marble Fork Kaweah River.

3. NARROWLEAF YERBA-SANTA (*Eriodictyon angustifolium* Nutt.).—This species differs from California yerba-santa in having the leaf margins inrolled to form linear leaves. The leaves also tend to be bunched along the stems more than in the California species.

Occurrence.—ZION: ½ mile north of Silver Reef Mine.

VERBENA FAMILY (Verbenaceae)

WRIGHT LIPPIA (*Lippia Wrighti* Gray).—Erect aromatic shrub, 2 to 4 feet high, with widely spreading opposite branches; bark of young stems stringy, soon peeling, the old bark roughened; leaves small, mostly ¼ to ½

inch long, egg-shaped to oval, roughish above, softly and densely hairy below, the margins toothed; flowers small, white, borne in long slender clusters, 1 to 2½ inches long; corolla 2-lipped; fruit becoming 2 small seed-like nutlets.

Occurrence.—GRAND CANYON, in the canyon: Clear Creek trail below Phantom Point; Kaibab Trail along switchbacks below Tip-off; Bright Angel Creek about 2 miles above Phantom Ranch.

MINT FAMILY (Menthaceae)

DESERT SAGE (*Salvia carnosa* Dougl.).—Low compact, densely branched shrub, ¾ to 2½ feet high; leaves ¼ to ¾ inch long, elliptic to broadly wedge-shaped, tapering towards the base into short slender leaf-stalks, the whole finely white-felty; flowers borne in the axils of reddish-purple leaf-like bracts crowded into dense cushion-like clusters borne at intervals along the upper part of the branches; corolla light violet-blue, tubular, the tube ¼ to ½ inch long and divided near the top into two unequal lips, the stamens standing far out from the tube; fruits small, dividing into 4 tiny nutlets.

Occurrence.—ZION. GRAND CANYON. occasional in the canyon, 3,800 to 6,200 feet: Cedar Ridge near the fossil fern quarry on the Kaibab trail; Bright Angel trail just below Indian Gardens.

NIGHTSHADE FAMILY (Solanaceae)

WOLFBERRY, DESERT-THORN (*Lycium* L.)

FIELD GUIDE TO THE SPECIES

Leaves ½ to 2 inches long, ⅛ to ¼ inch wide; berries globose.

Flowers large, ½ to ¾ inch long, trumpet-shaped; the corolla lobes not hairy; berry dull white to purplish-blue ..... 1. *L. pallidum.*

Flowers smaller, about ½ inch long; the corolla lobes with hairy margins; berry red ..... 2. *L. Torreyi.*

Leaves ¼ to ½ inch long, linear-spatula-shaped, thick and fleshy; berry elliptic, yellow to red ..... 3. *L. Andersoni.*

1. PALE WOLFBERRY (*Lycium pallidum* Miers), fig. 125.—Widely spreading shrub 1½ to 3 feet high with stout thorny branchlets; leaves smooth or very finely hairy, whitish, egg-shaped to elliptic or oblong, rounded at tips and tapering to base, 1 to 2 inches long, tending to be clustered at the joints of the stems; flowers broadly funnel-shaped, about ½ to ¾ inch long, pale greenish or yellowish or tinged with purple, usually borne singly in the leaf-axils and hanging from the underside of the stems; berries globose, 1/3 to ½ inch in diameter, white to purplish with a bloom.

The berries were eaten by the American Indians and are much relished by birds and small mammals. In some regions the herbage is browsed to a considerable extent in spite of the thorns. The stumps sprout readily when the stems are cut down, often forming thickets.

Occurrence.—MESA VERDE: near Far View House. ZION: hill above Coalpits Wash, near west entrance, 4,000 feet. GRAND CANYON, on the South Rim: Pasture Wash.

2. TORREY WOLFBERRY, SQUAW DESERT-THORN (*Lycium Torreyi*

Gray).—Spreading shrub 3 to 8 feet high with large stout thorns or nearly thornless; stems and leaves smooth; leaves oblong to spatula-shaped, ½ to 1½ inches long, tending to be clustered at the stem joints; flowers narrowly funnel-shaped, about ½ inch long, lavender-purple, mostly several in a leaf-cluster; berries globose, red, about ¼ inch in diameter.

Occurrence.— GRAND CANYON: found in Grand Canyon National Monument just west of park.

3. ANDERSON WOLFBERRY (*Lycium Andersoni* Gray), fig. 126.—Intricately branched spiny shrub 1 to 4 feet high, with whitish bark; leaves spatula-shaped, mostly ¼ to ½ inch long, at first thick and fleshy, borne along the stems in bunches of several; flowers slender-funnelform, about ½ to ¾ inch long, the corolla tube yellowish, the lobes lavender; berries elliptic, small, less than ¼ inch long, yellow to red.

Fig. 125. Pale wolfberry (*Lycium pallidum*).

Fig. 126. Anderson wolfberry (*Lycium Andersoni*).

During the flowering period and before, the leaves are very turgid and almost cylindric, but later, after the ripening of the fruits or during periods of drought, they become flattened and limp. They act as reservoirs of water, as is

true of many desert plants, and the developing fruits, which are quite juicy when ripe, quickly deplete this supply.

Occurrence.—GRAND CANYON, common in the canyon on the Tonto, about 4,000 feet: Hermit trail; Kaibab trail on both sides of the Colorado River; Bright Angel trail below Indian Gardens.

FIGWORT FAMILY (Scrophulariaceae)

FIELD GUIDE TO THE GENERA

Leaves sticky-glutinous above; flowers yellowish salmon-color; found in Sequoia National Park ..... DIPLACUS, p. 210.

Leaves not sitcky-glutinous; flowers blue, purple, red, whitish, or yellowish; widespread in the parks ..... PENSTEMON, p. 210.

BUSH MONKEYFLOWER (*Diplacus longiflorus* Nutt. var. *calycinus* Jepson).—Widely branched shrub 1 to 3 feet high; young stems and flower stalks white-woolly with sticky-glandular hairs; leaves broadly lance-shaped to oblong-egg-shaped, 1 to 3 inches long, yellowish-green, sticky-glutinous above, hairy below, the margins not toothed or slightly toothed; flowers 1½ to 2¾ inches long, the corolla yellowish salmon-color, tubular, the tube slender below and expanding into a broad throat, the lobes 2-lipped; calyx 5-angled, cylindric; capsule oblong, about ¾ inch long, 2-valved, many-seeded.

Occurrence.—SEQUOIA.

PENSTEMON, BEARDTONGUE (*Penstemon* Mitch.)

The name, *Penstemon*, is derived from the Greek *pente*, five, and *stemon*, stamen. Ordinarily in this genus there are four pollen-bearing stamens and a fifth sterile stamen which is merely a stalk or filament without an anther. This is sometimes bearded on the end, hence the common name, beardtongue. The broadly tubular or funnel-shaped corolla is 2-lipped as in the flowers of a snapdragon except that the throat is not closed. The oblong, 2-valved, many-seeded capsules sometimes remain attached to the dried stems all winter. The flowers are among the most attractive in the western national parks and many species are cultivated as ornamentals. Only a few species are truly shrubby but several of the woody-based species are considered here also.

FIELD GUIDE TO THE SPECIES

Leaves oblong, oblong-lance-shaped or spatula-shaped to egg-shaped or roundish.

Flowers ⅜ to ½ inch long, yellowish to whitish or tinged with pink or purple; sterile filament not bearded; anthers not woolly.

Flower-clusters unbranched, spike-like; leaves egg-shaped to oblong, ¼ to ¾ inch long, somewhat heart-shaped at base ..... 1. *P. Rothrockii*.

Flower-clusters loosely branched; leaves oblong to narrowly lance-shaped, ½ to 2 inches long, not heart-shaped at base ..... 2. *P. breviflorus*.

Flowers ¾ to 1½ inches long, purple-blue or red; sterile filament bearded or not bearded; anthers woolly or not woolly.

Leaves narrowly elliptic to broadly egg-shaped or roundish, ¼ to 1¼ inches long; anthers densely woolly; sterile filament bearded or not.

Flowers blue to lavender-purple; sterile filament bearded or not.
Plants ½ to 2 feet high; leaves usually finely toothed; sterile filament not bearded ..... 3. *P. fruticosus.*
Plants 2 to 6 inches high; leaves mostly not toothed.
Sterile filament not bearded; occurs at Glacier National Park ..... 4. *P. ellipticus.*
Sterile filament bearded; occurs in Pacific Coast parks ..... 5. *P. Davidsoni.*
Flowers red; sterile filament bearded.
Leaves toothed or not toothed; occurs in California parks ..... 6. *P. Newberryi.*
Leaves mostly toothed; occurs in Oregon and Washington parks ..... 7. *P. rupicola.*
Leaves mostly narrowly oblong to spatula-shaped, ¾ to 3 inches long; sterile filament not bearded; anthers woolly or not.
Flowers lilac-purple, broadly funnel-shaped; leaves finely toothed; anthers woolly ..... 8. *P. Scouleri.*
Flowers red, tubular funnel-shaped; leaves not toothed; anthers not woolly ..... 9. *P. Bridgesi.*
Leaves linear or awl-shaped, pointed; flowers about ¼ to ¾ inch long; anthers not woolly.
Flowers pink or rose-color; leaves 1 to 2 inches long; sterile filament not bearded ..... 10. *P. ambiguus.*
Flowers blue; leaves ¼ to ½ inch long; sterile filament bearded ..... 11. *P. linarioides.*

1. ROTHROCK PENSTEMON (*Penstemon Rothrocki* Gray).—Bushy shrub, 1 to 2 feet high; leaves egg-shaped to oblong-egg-shaped, somewhat heart-shaped at base, ¼ to ¾ inch long, grayish with short stiff hairs, the margins toothed or not toothed, often wavy; flowers dull yellow, sometimes tinged with pink or purple, ⅜ to ½ inch long, borne on an unbranched stem to form a spike-like flower cluster; sterile filament not bearded; anthers not woolly.

Occurrence.—SEQUOIA.

2. STUBFLOWER PENSTEMON (*Penstemon breviflorus* Lindl.).—Loosely branched evergreen shrub, 1 to 3 feet high; leaves oblong to narrowly lance-shaped, ½ to 2 inches long, pale green, the margins finely toothed or the upper scarcely toothed; flowers usually whitish with pink or purple markings, about ½ inch long, borne in loosely branched clusters; sterile filament not bearded at tip; anthers not woolly.

Occurrence.—YOSEMITE.

3. BUSH PENSTEMON (*Penstemon fruticosus* (Pursh) Greene).—Erect shrub ½ to 2 feet high; leaves leathery, the lower spatula-shaped, or reverse-egg-shaped to lance-shaped, ¾ to 1 inch long, finely toothed, the upper smaller, egg-shaped; flowers purple, about 1 to 1½ inches long; anthers woolly; sterile filament not bearded.

Occurrence.—MOUNT RAINIER.

4. ROCKVINE PENSTEMON (*Penstemon ellipticus* Coult. & Fish.).—Prostrate woody-based plants about 6 inches high, often forming dense mats 2 feet across; leaves thickish, egg-shaped to roundish; flowering branches covered with short, sticky-glandular hairs; flowers about 1½ inches long, purple or violet; sterile filament not bearded; anthers woolly.

Occurrence.—GLACIER, common, 6,000 to 8,000 feet: Hanging Gardens near Logan Pass; Skyline trail to Granite Park; above Lake Ellen Wilson; Sperry Glacier trail; trail to Swiftcurrent Peak; Iceberg Lake; above Ptarmigan Lake; Brown's Pass.

5. DAVIDSON PENSTEMON (*Penstemon Davidsoni* Greene).—Prostrate woody-based plant often forming broad dense mats; leaves thickish, reverse-egg-shaped to almost round, ¼ to ½ inch long, smooth, not toothed; flowers lilac-purple, 1 to 1½ inches long, 1 to 5, borne along short flowering stems; sterile filament bearded at the tip; anthers woolly. (Syn. *P. Menziesi* Hook. var. *Davidsoni* Piper).

Occurrence.—OLYMPIC, common, 5,000 to 6,000 feet: Queets Divide; Martins Park. MOUNT RAINIER: near Mowich Lake. CRATER LAKE, common on the upper slopes and ledges: around the crater rim; Garfield Peak trail; Union Peak. LASSEN: Cinder Cone. YOSEMITE, timberline to 12,500 feet: Mount Conness; ridge southeast of Elizabeth Lake. KINGS CANYON: Mount Brewer; Harrison Pass trail. SEQUOIA, above timberline: Little Five Lakes; Mount Kaweah.

6. NEWBERRY PENSTEMON, MOUNTAIN PRIDE (*Penstemon Newberryi* Gray).—Low, somewhat shrubby plant, ¾ to 1½ feet high; leaves thickish, narrowly elliptic to almost round, ½ to 1¼ inches long, covered with a whitish bloom, finely toothed or not toothed; flowers bright red, 1 to 1¼ inches long, borne in unbranched clusters at the ends of the branches; sterile filament bearded; anthers densely woolly. (Syn. *P. Menziesi* Hook. var. *Newberryi* Gray).

Occurrence.—LASSEN: Cinder Cone, 7,200 feet. YOSEMITE. KINGS CANYON: Harrison Pass trail. SEQUOIA.

7. CLIFF PENSTEMON (*Penstemon rupicola* Howell).—Low spreading woody-based plant about 6 inches high; leaves thickish, elliptic to roundish, about ½ inch long, smooth, covered with a whitish bloom, mostly toothed; flowers red; sterile filament bearded; anthers woolly; occurs on rocky ledges and ridges.

Occurrence.—MOUNT RAINIER. CRATER LAKE: Garfield Peak trail; Llao Rock; ridge west of Pumice Flat.

8. SCOULER PENSTEMON (*Penstemon Scouleri* Dougl.).—Low shrub 9 to 20 inches high; leaves lance-shaped to narrowly reverse-lance-shaped, ¾ to 1¼ inches long, toothed; flowers lilac-purple, 1 to 1½ inches long; anthers woolly; sterile filament not bearded. (Syn. *P. Menziesi* Hook. var. *Scouleri* Gray).

Occurrence.—YELLOWSTONE, reported.

9. BRIDGES PENSTEMON (*Penstemon Bridgesi* Gray).—Somewhat shrubby plant, 1 to 2½ feet high; leaves linear to spatula-shaped, 1½ to 3 inches

long, the margins not toothed; flowers scarlet, 1 to 1¼ inches long, borne in narrow branched clusters; sterile filament not bearded; anthers not woolly.

Occurrence.—YOSEMITE. KINGS CANYON: East Lake. SEQUOIA. MESA VERDE. ZION. GRAND CANYON.

10. COW-TOBACCO (*Penstemon ambiguus* Torr. subsp. *laevissimus* Keck).—Much-branched bush with stems woody at the base, 2 to 5 feet high; leaves linear, 1 to 2 inches long, green, smooth or very finely hairy; flowers pink or rose-color, about ½ inch long, borne in narrow branched clusters; sterile filament not bearded; anthers not woolly.

Occurrence.—BRYCE CANYON. ZION.

11. TOADFLAX PENSTEMON (*Penstemon linarioides* Gray).—More or less prostrate woody-based dwarf with leaves closely covering the lower stems; leaves linear or awl-shaped, ¼ to ¾ inch long, pointed at the tip; flowers blue, about ¾ inch long; sterile stamen more or less bearded; anthers not woolly. Two subspecies are recognized in the national parks. (Syn. *P. abietinus* Pennell.)

11a. SILER TOADFLAX PENSTEMON (Subspecies *Sileri* (Gray) Greene).—Plants green, smooth or thinly hairy; sterile filaments bearded.

Occurrence.—BRYCE CANYON, 8,000 feet. ZION: south of junction of highway no. 89 with Alton road, 7,000 feet. GRAND CANYON, common in the forest on the South Rim, about 7,000 feet: Grand Canyon Village; Grandview Point; 2 miles south of Yaki Point.

11b. COLORADO PENSTEMON (Subspecies *coloradoensis* Keck).—Plants whitish or grayish with fine appressed hairs; sterile filaments not bearded. (Syn. *P. coloradoensis* Nels.).

Occurrence.—MESA VERDE.

CATALPA FAMILY (Bignoniaceae)

DESERT WILLOW (*Chilopsis linearis* (Cav.) Sweet).—Large shrub to small tree, 10 to 20 feet high, branched from the base with many slender willow-like stems; leaves mostly alternate, linear or linear-lance-shaped, 2 to 5 inches long, sharp-pointed, green on both sides, not toothed; flowers pink to whitish, showy, 1 to 2 inches long, broadly funnel-shaped, 2-lipped, borne in few-flowered clusters at the ends of the branchlets; capsules linear, 4 to 10 inches long; many seeded; seeds oblong, flattish, with long silky hairs at both ends.

Occurrence.—GRAND CANYON, rare in the canyon: Havasu Canyon, 3,500 feet.

MADDER FAMILY (Rubiaceae)

BEDSTRAW (*Galium stellatum* Kell. var. *eremicum* Hilend & Howell).—Low, much-branched plant 5 to 12 inches high, with slender woody lower stems; stems 4-angled; leaves narrowly egg-shaped to lance-shaped, about ¼ to ½ inch long, the older stiffish and sharp-pointed, borne in circles of 4;

flowers tiny, 4-lobed, white, crowded in clusters of several in the leaf-axils; fruits small, divided into 2 seed-like structures, white-hairy with long stiff hairs longer than the diameter of the fruit.

Occurrence.—GRAND CANYON, in the canyon, 2,500 ot 6,500 feet: Bright Angel trail near the Colorado River and several miles above; Kaibab trail above Roaring Springs; Bright Angel Creek above Phantom Ranch.

HONEYSUCKLE FAMILY (Caprifoliaceae)

FIELD GUIDE TO THE GENERA

Leaves with untoothed margins, mostly rounded or blunt-pointed at tips.

Corollas bell-shaped to funnel-shaped, with short lobes, regular, white to pinkish; berries dry, spongy, white ..... SYMPHORICARPOS, p. 214.

Corollas tubular, rather deeply lobed or 2-lipped, white, yellow, orange, red, or purple, the tubes usually with swelling on one side; berries juicy, not white ..... LONICERA, p. 218.

Leaves with margins toothed, pointed at tips.

Corollas yellow, funnel-shaped, rather deeply lobed; fruits dry capsules; low shrubs mostly less than 3 feet high ..... DIERVILLA, p. 223.

Corollas white, saucer-shaped with short tubes; fruits berry-like; tall shrubs mostly more than 3 feet high.

Leaves simple; fruits red, containing a single flattened seed ..... VIBURNUM, p. 224.

Leaves divided into several pairs of leaflets; fruits small red or purple-black berries with 3 to 5 seed-like nutlets ..... SAMBUCUS, p. 225.

SNOWBERRY (*Symphoricarpos* L.)

The snowberries are rather low shrubs with slender branches, usually grayish-green foliage, and inflated-looking waxy-white berries. The flowers are small and not very conspicuous, but because of the attractive fruits which remain on the bushes for a long time, snowberries are often cultivated as ornamentals. The foliage is browsed by deer and birds eat the berries.

FIELD GUIDE TO THE SPECIES

Flowers broadly bell-shaped, about 1/4 inch long, hairy in the throat; leaves mostly elliptic to egg-shaped or roundish.

Leaves mostly smooth, at least above; flowers densely hairy in the throat; erect shrubs ..... 1. *S. albus.*

Leaves finely and softly hairy; flowers sparsely hairy in the throat; low spreading or prostrate shrubs ..... 2. *S. mollis.*

Flowers narrowly bell-shaped to funnel-shaped or tubular, 1/4 to 5/8 inch long, the throat hairy or not hairy inside; leaves narrowly oblong to elliptic or oval.

Flowers 1/4 to 1/2 inch long, the corolla-tubes hairy or not hairy inside ..... 3. *S. rotundifolius.*

Flowers 3/8 to 5/8 inch long, the corolla-tubes scarcely hairy inside ..... 4. *S. longiflorus.*

1. COMMON SNOWBERRY (*Symphoricarpos albus* (L.) Blake), fig. 127. —Spreading shrubs 2 to 5 feet high; leaves thickish, oval to egg-shaped or roundish, broadly lobed or wavy-margined, mostly smooth above, sometimes

Fig. 127. Common snowberry (*Symphoricarpos albus*).

hairy below, 1/4 to 1 1/2 inches long; flowers white or pinkish, the corollas densely hairy within, borne few to several in rather crowded clusters at the ends of the branches and in the leaf-axils; berries white, round or oval, 1/3 to 1/2 inch in diameter. (Syn. *S. racemosus* Michx.).

The leaves, particularly of the sterile shoots, are very variable and there is considerable variation in type and amount of hairiness of the herbage. Several different forms have been named, such as *S. occidentalis* Hook., with protruding stamens and styles, and the dwarf hairy *S. pauciflorus* Blake with fewer flowers. Also, there is the more luxuriant Pacific coast variety *laevigatus* Blake (syn. *S. rivularis* Suksd.), a generally taller form with mostly smooth leaves and larger fruits. This is the variety most commonly cultivated in gardens. It is native west of the Continental Divide.

Occurrence.—OLYMPIC, at lower elevations: Mount Angeles; Elwha River; Enchanted Valley. CRATER LAKE, rare: south entrance. GLACIER, common, 3,000 to 5,000 feet: Swiftcurrent Lake; trail to Iceberg Lake; St. Mary Lake; Cut Bank Valley; Belton; Lake McDonald. YELLOWSTONE: Mammoth; lower slopes of Electric Peak. MESA VERDE. GRAND CANYON, on the North Rim. ISLE ROYALE, common: trail to Lake Richie; Daisy Farm; old Rock Harbor lighthouse; Greenstone Ridge between Mount Ojibway and Monument Rock.

2. SPREADING SNOWBERRY (*Symphoricarpos mollis* Nutt.).—Low spreading or more or less trailing shrubs 1 foot high; leaves oval to elliptic, pointed at the tips or rounded, 1/2 to 2/3 inch long, often lobed or irregularly toothed, hairy on both sides, especially below; flowers white or pink, borne towards the ends of the branches in small clusters in the leaf-axils; berries white, globose, about 1/4 inch in diameter.

As is true of all the species of snowberry, this trailing form is very variable in leaf-shape and in the type and quantity of hairiness. Hence it has been divided into several species. WASHINGTON SNOWBERRY (*S. hesperius* G. N.

Fig. 128. Washington snowberry (*Symphoricarpos hesperius*).

Fig. 129. Roundleaf snowberry (*Symphoricarpos rotundifolius*).

Jones), fig. 128, with thinnish oval pointed leaves and nearly smooth twigs, is the form found in the Northwest, at Olympic and Mount Rainier National Parks. SHARPLEAF SNOWBERRY (*S. acutus* (Gray) Dieck), with densely hairy twigs and leaves, occurs in the southern Cascades and Sierra Nevada parks from Crater Lake south to Kings Canyon. *S. mollis* is a California form with firm roundish-oval leaves not pointed at the tips.

Occurrence.—OLYMPIC: trail to Constance Ridge. MOUNT RAINIER: Longmire; Nisqually Valley; Mount Wow; White River, near old camp. CRATER LAKE: south entrance to park; Trapper Creek. LASSEN: Lassen Peak. YOSEMITE, common, 4,000 to 8,500 feet: Yosemite Valley; Ledge trail; Pohono trail; Gray Creek; Crane Flat road north of Merced Grove; Muir Gorge. KINGS CANYON: near Sphinx Creek. SEQUOIA, 5,000 to 7,000 feet: Black Rock Pass; head of Bennett Creek; near Colony Mill.

3. ROUNDLEAF SNOWBERRY (*Symphoricarpos rotundifolius* Gray), fig. 129.—Spreading shrubs 1 to 4 feet high, the stems sometimes nearly prostrate; leaves smooth or hairy, oblong to elliptic, broadly oval, or egg-shaped, ½ to 1 inch long, those of sterile shoots sometimes rounded and few-toothed; flowers ¼ to ½ inch long, the corolla narrowly bell-shaped, white with a pinkish or yellowish tinge, hairy on the inside or in some forms smooth, with 5 glandular areas at the base; styles smooth; berries waxy-white, globose or oblong.

As considered here, this species is very variable. Jones in his monograph

on Symphoricarpos[45] considers several species not included here. He indicates that *S. rotundifolius* is confined to the southern part of the range. *S. Parishi* Rydb., a dwarf spreading form with the corollas shorter, scarcely more than 1/4 inch long, and hairy on the inside, occurs at Grand Canyon and in the southern Sierra Nevada parks. Two other species are similar to *S. Parishi* but with slightly larger flowers. *S. tetonensis* Nels., with smooth leaves and twigs and the corolla-tube smooth on the inside, occurs at Grand Teton and Yellowstone National Parks. *S. vaccinioides* Rydb., with hairy twigs, numerous small pointed leaves, and the inside of the corolla-tubes hairy on the lower half, is listed from Yellowstone and Kings Canyon National Parks.

Occurrence.—YOSEMITE, occasional, 6,000 to 9,000 feet: Rainbow Falls; Tuolumne Meadows; Mount Dana; near junction of Pleasant Valley and Pate Valley trails; Matterhorn Canyon. KINGS CANYON: East Lake; Junction Meadow; between Charlotte Creek and Junction Meadow. SEQUOIA, occasional, 5,000 to 10,000 feet: Mount Whitney trail; between Little Kern River and Farewell Gap. YELLOWSTONE, common: near east entrance; Sylvan Pass; north of Canyon Junction; Specimen Ridge; Yellowstone Falls. GRAND TETON, about 6,500 feet: 1 mile south of park headquarters; Jackson Lake; east of Moran Bay snowshoe cabin; above Whitegrass Ranch. ROCKY MOUNTAIN. MESA VERDE, occasional, 6,000 to 7,700 feet: near lower end of Spruce Canyon; Navajo Canyon. BRYCE CANYON, 7,000 to 9,100 feet: near Bryce Lodge; Far View; Rainbow Mountain. ZION, on the plateau: East Rim trail near mouth of Hidden Canyon. GRAND CANYON, 5,000 to 8,500 feet. North Rim, common: Thompson Canyon; Bright Angel Point; Neal Spring; Walhalla Plateau; Swamp Point. South Rim, common: Grand Canyon Village; Grand View; 2 miles south of Yaki Point. Canyon, common: Bright Angel trail; Hermit trail; Kaibab trail below both rims.

4. LONGFLOWER SNOWBERRY (*Symphoricarpos longiflorus* Gray), fig. 130. — Spreading shrubs 1 to 4 feet high with numerous short branches and smooth or nearly smooth herbage; leaves reverse-lance-shaped, 1/4 to 5/8 inch long, covered with a whitish bloom; flowers tubular-funnel-shaped, 3/8 to 5/8 inch long, scarcely if at all hairy on the inside; with a single glandular area at the base; style hairy.

MOUNTAIN SNOWBERRY (*S. oreophilus* Gray) is similar, but with 5 glandular areas at the base of the corolla on the inside and the styles not hairy. UTAH SNOWBERRY (*S. utahensis* Rydb.) is similar to *S. oreophilus* but the young twigs are hairy and the corolla tubes slightly shorter and hairy on the inside.

Occurrence.—ZION, 4,000 feet: near south entrance. GRAND CANYON: Kaibab Plateau; Kaibab trail below both rims; Bright Angel trail a little below South Rim.

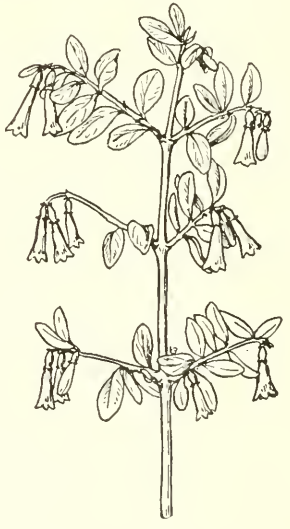

Fig. 130. Longflower snowberry (*Symphoricarpos longiflorus*).

45 Jones, G. N. A monograph of the genus Symphoricarpos. Arnold Arboretum Jour. 21: 201-252. 1940.

HONEYSUCKLE (*Lonicera* L.)

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Upright shrubs; flowers in pairs, rarely solitary; leaves distinct.
- Corollas yellow or yellowish, regular or nearly so, the lobes distinctly shorter than the tubes.
  - Bracts below flowers large, more or less enveloping the ovaries, becoming red and conspicuous in fruit; fruits purple-black ..... 1. *L. involucrata.*
  - Bracts below flowers small, usually awl-shaped; fruits black or red.
    - Ovaries enclosed by sac-like united bractlets which becomes juicy and colored in fruit, appearing as a single black berry.
      - Corollas usually finely hairy outside; found in western parks ..... 2. *L. coerulea.*
      - Corollas usually smooth outside; found on Isle Royale ..... 3. *L. villosa* var.
    - Ovaries slightly joined below, appearing as twin berries, red when ripe.
      - Leaves somewhat pointed at the tips, the margins thinly hairy; corolla-tubes strongly swollen on one side at the base; eastern species ..... 4. *L. canadensis.*
      - Leaves smooth or slightly hairy on margins at very base; corolla-tubes slightly swollen on one side at the base; western species ..... 5. *L. utahensis.*
- Corollas dark purple-red, 2-lipped, the tubes mostly shorter than the lobes ..... 6. *L. conjugialis.*

Bushy or high climbing shrubs with trailing or twining branches; flowers borne in circles along the stems near the ends or in head-like clusters; upper leaf pairs usually joined into saucer-like structures.
- Low shrubs with stems trailing along the ground; corollas slightly 2-lipped, the tubes swollen on one side above the base.
  - Leaves 2 to 4 inches long; found in Northwest ..... 7. *L. ciliosa.*
  - Leaves ¾ to 2 inches long; found in Southwest ..... 8. *L. arizonica.*
- Bushy or climbing shrubs with twining branches; corollas strongly 2-lipped, the tubes swollen on one side at the base.
  - Leaves dull green, hairy on both sides; corollas glandular outside ..... 9. *L. hirsuta.*
  - Leaves green above, paler or whitish below, smooth, or hairy only below; corollas smooth or sparingly hairy outside.
    - Leaves oblong, 2 to 4 inches long; eastern species ..... 10. *L. dioica.*
    - Leaves roundish to egg-shaped or elliptic-oblong; ¾ to 1 inch long; western species ..... 11. *L. interrupta.*

1. BEARBERRY HONEYSUCKLE, BLACK TWINBERRY (*Lonicera involucrata* (Rich.) Banks), fig. 131.—Widely branching shrub 1 to 6 feet high with 4-angled branches; leaves narrowly egg-shaped to oblong, pointed at the tips, with a prominent midrib, the margins not toothed, 2 to 5 inches long, dark green; flowers yellow, about ½ to ¾ inch long, tubular, scarcely 2-lipped, with a swollen pouch at base of tube, borne in pairs and surrounded at the base by a cup-like involucre composed of two broad leaf-like bracts; berries

shiny black, surrounded by the persistent involucre which becomes dark red in fruit and expands to expose the berries. The twigs are browsed to a certain extent by deer and elk during the winter.

Occurrence.—OLYMPIC: Lake Quinault; Beaver Creek. MOUNT RAINIER, occasional in wet places, 2,000 to 4,500 feet: Longmire. CRATER LAKE. YOSEMITE, 4,500 to 9,500 feet: Yosemite Valley; Inspiration Point; Cloud's Rest; Pohono trail; Conness Creek; Tuolumne Meadows; Vogelsang Pass; Dana Meadows; Porcupine Flat trail. KINGS CANYON: East Lake. SEQUOIA, occasional in meadows and moist locations, 6,000 to 9,000 feet: between Lion and Tamarack Lakes ; Tocopah Falls. GLACIER, common in the woods, especially along streams, 3,000 to 6,000 feet: Three-top Mountain trail; west of Logging Lake; Lake McDonald; Avalanche Lake; west of Logan Pass; Two Medicine Lake; Cut Bank Valley; Hudson Bay Creek trail; Swiftcurrent Lake; Josephine Lake. YELLOWSTONE, occasional; east entrance; Firehole River; near Old Faithful. GRAND TETON, occasional in moist areas, 6,500 to 7,000 feet: Granite Canyon; south of park headquarters. ROCKY MOUNTAIN, occasional at higher elevations: north of Mount Acoma, 9,100 feet. ISLE ROYALE, in the woods: Mott Island; Lake Richie trail; Tobin Harbor.

2. SWEETBERRY HONEYSUCKLE (*Lonicera coerulea* L.)—Low branched shrub 1 to 2 feet high, with brown smooth bark peeling off in long scales; leaves mostly oblong, ¾ to 1½ inches long, smooth or somewhat hairy; flowers yellowish, the corollas funnel-shaped, about ½ inch long, finely hairy outside, deeply divided into 5 parts, the tube somewhat swollen at the base, borne in pairs on very short stalks in the leaf-axils; berries separate, but closely surrounded by a fleshy cup which gives the appearance of a single purplish-black berry about ¼ inch in diameter.

Occurrence.—YOSEMITE, rare: Crescent Lake; Tuolumne Meadows, along Creek. YELLOWSTONE, common: Snow Pass; Mammoth; Gibbon River; Lone Star; Yellowstone Falls; hillside above Camp Roosevelt.

Fig. 131. Bearberry honeysuckle (*Lonicera involucrata*).

3. MOUNTAIN FLY HONEYSUCKLE (*Lonicera villosa* (Michx.) R. & S. var. *Solonis* (Eat.) Fern.).—Similar to *L. coerulea*, but the young branchlets with very fine hairs and long hairs; leaves hairy below; corollas usually smooth.

Occurrence.—ISLE ROYALE, in wet woods and along margins of bogs: near Feldtmann Lake; Grace Harbor; head of Siskiwit Bay; McCargo Cove.

4. AMERICAN FLY HONEYSUCKLE (*Lonicera canadensis* Marsh.), fig. 132.—Erect branching shrub 3 to 4½ feet high, the herbage light green; leaves thinnish, oblong-egg-shaped, 1½ to 3 inches long, somewhat pointed at the tips, rounded or heart-shaped at base, the margins hairy, finely hairy below at first; flowers greenish-yellow or whitish, ½ to 1¾ inches long, the corolla tubular-funnel-shaped, with a swelling at base of tube, borne in pairs

at the ends of slender stems about 1 inch long in the leaf-axils; berries paired, distinct or lightly jointed at base, bright red. (Syn. *L. ciliata* Muhl.).

Occurrence. — ISLE ROYale, common in the woods: near old Rock Harbor lighthouse; Washington Harbor; Lake Desor trail.

5. UTAH HONEYSUCKLE, RED TWINBERRY (*Lonicera utahensis* Wats.), fig. 133.— Spreading shrub 2 to 5 feet high; leaves elliptic to oblong, rounded at both ends, short-stalked, 3/4 to 2 1/2 inches long, pale green, the margins not toothed, sometimes sparsely hairy at base; flowers pale yellow to white, about 1/2 to 3/4 inch long, funnel-shaped, the tube slightly swollen at base, borne in pairs at the ends of short stems in the leaf-axils; berries in pairs, bright red.

Fig. 132. American fly honeysuckle (*Lonicera canadensis*).

Fig. 133. Utah honeysuckle (*Lonicera utahensis*).

Occurrence. — OLYMPIC: Mount Angeles, 4,000 feet; trail to Constance Ridge. CRATER LAKE, rare: Boundary Spring. GLACIER, common, 3,100 feet to timberline: Logging Lake; Lake McDonald; trail to Sperry Glacier; Avalanche Lake; St. Mary Lake; Swiftcurrent Lake; Josephine Lake. YELLOWSTONE, rare, 7,500 feet: Sylvan Pass; above Lost Lake; Mammoth. GRAND TETON: mouth of Death Canyon, 6,700 feet.

6. PURPLEFLOWER HONEYSUCKLE (*Lonicera conjugialis* Kell.).—Slender shrub 2 to 5 feet high; leaves 3/4 to 2 1/2

inches long, oblong to elliptic or egg-shaped, rounded or pointed at tips, smooth or finely hairy; flowers dark purple-red, 1/3 to ½ inch long, tubular, 2-lipped, the throat with soft white hairs inside, the tube swollen below the oblong lower lip, borne in pairs on slender stems in the leaf-axils; berries red, partly united to form a double berry sometimes ½ inch across. The berries are eaten by birds, especially grouse.

Occurrence.—CRATER LAKE, 5,000 to 6,500 feet: the Pinnacles; near park headquarters. LASSEN: Hot Springs Valley; Snag Lake. YOSEMITE, occasional, 6,500 to 9,500 feet: Yosemite Valley; Mariposa Grove; Glacier Point; Lyell Meadows; trail above Smedberg Lake; near Tuolumne Meadows; Isberg Pass trail; Laurel Lake near Beehive. KINGS CANYON: Reflection Lake. SEQUOIA, occasional, 4,000 to 10,000 feet: Farewell Gap; Hockett Meadows; Mount Silliman; Marble Fork Kaweah River.

SWAMP FLY HONEYSUCKLE (*Lonicera oblongifolia* (Goldie) Hook.), a bushy shrub with somewhat hairy herbage, yellowish-white 2-lipped corollas, and red or purplish berries, has been reported from Isle Royale.

7. WESTERN TRUMPET HONEYSUCKLE (*Lonicera ciliosa* (Pursh) Poir.).—Trailing or climbing shrub with slender twining stems 1 to 6 (or 20) feet long; leaves 2 to 4 inches long, oval, blunt-pointed or rounded at the tips, smooth and green above, whitish below, the margins finely hairy, upper pair joined into a saucer-like structure; flowers reddish-yellow or orange, funnel-shaped, ¾ to 1½ inches long, the tube somewhat swollen above the base, borne in head-like clusters at the ends of the branches; berries orange-red.

Occurrence.—OLYMPIC: Skokomish Valley; Port Angeles. MOUNT RAINIER, in open woods at lower elevations: Nisqually Valley; Cowlitz River near Canyon Bridge.

8. ARIZONA HONEYSUCKLE (*Lonicera arizonica* Rehd.).—Similar to *L. ciliosa*, but the stems straggling over bushes, seldom twining; leaves ¾ to 2½ inches long, egg-shaped, broadly oval, or nearly round, whitish below, the uppermost pair joined into a saucer-like structure some distance below the flower cluster; corollas reddish outside, orange inside, funnel-shaped, 1¼ to 1¾ inches long, the tube swollen above the base on one side, borne in head-like clusters at the ends of slender stems; berries red.

Occurrence.—GRAND CANYON.

9 HAIRY HONEYSUCKLE (*Lonicera hirsuta* Eat.), fig. 134.—High climbing twining shrub with softly hairy branches; leaves

Fig. 134. Hairy honeysuckle (*Lonicera hirsuta*).

broadly oval, dull green, hairy on both sides, the upper pairs united; flowers in circles near the ends of the branches; flowers orange-yellow, hairy, the tube slender, with a swelling on one side at the base; berries orange-red.

Occurrence.—ISLE ROYALE, common in the woods: head of Rock Harbor; Lake Richie trail.

10. LIMBER HONEYSUCKLE (*Lonicera dioica* L.).—Bushy shrub 3 to 9 feet high, the stems twining; leaves oblong, often with wavy margins, 2 to 3 (or 4) inches long, green above, smooth, whitish below, the upper pairs joined to form saucer-like structures; flowers grenish-yellow, tinged with purple, funnel-shaped, about ¾ to 1 inch long, the tube hairy inside, swollen at the base on one side, borne in head-like clusters at the ends of the branches; berries orange-red. (Syn. *L. glauca* Hill.)

Occurrence.—MESA VERDE.

10a. DONALD HONEYSUCKLE (Var. *glaucescens* (Rydb. Butters), fig. 135.—Twining shrub with leaves green on both sides, smooth above, hairy below; corollas yellow, about ¾ inch long, the tube swollen at the base on one side; berries smooth, red or orange. (Syn. *L. glaucescens* Rydb.).

Fig. 135. Donald honeysuckle (*Lonicera dioica* var. *glaucescens*).

Fig. 136. Chaparral honeysuckle (*Lonicera interrupta*).

Occurrence.—ISLE ROYALE, common in rock openings and near rocky shores; Mott Island; Lake Richie trail.

11. CHAPARRAL HONEYSUCKLE (*Lonicera interrupta* Benth.), fig. 136. —Evergreen bushy shrub with main stem usually erect, 1 to 3 feet high, the branches climbing or straggling over bushes; bark smooth, often reddish, with a bloom; leaves ¾ to 1½ inches long, elliptic to egg-shaped or roundish, rounded or blunt-pointed at the tips, green above, whitish below, the upper 1 to several pairs united to form a saucer-like structure; flowers yellow, about ½ inch long, 2-lipped, borne in circles along the upper part of the branches, forming interrupted oblong clusters 1 to 3 inches long, or becoming longer in fruit; berries red.

Occurrence.—YOSEMITE, common, 4,000 to 6,500 feet: Yosemite Valley; Yosemite Falls trail; Vernal Falls; Indian Creek; Inspiration Point; Bridal Veil Meadows. KINGS CANYON: switchbacks along Bubbs Creek trail. SEQUOIA.

DWARF BUSH HONEYSUCKLE (*Diervilla lonicera* Mill.), fig. 137.— Branching shrubs up to about 3 feet high, the herbage smooth; leaves egg-shaped to oblong-egg-shaped, 1¾ to 4 inches long, slender-pointed, the mar-

Fig. 137. Dwarf bush honeysuckle (*Diervilla lonicera*).

gins toothed; flowers yellow, funnel-shaped, deeply 5-lobed, slightly 2-lipped borne 2 or 3 together on short stems at or near the ends of the branches; capsules slender, about 1/3 inch long, narrowed to a beak at the tips; many-seeded.

Occurrence.—ISLE ROYALE: Daisy Farm; Rock Harbor Lodge.

VIBURNUM (*Viburnum* L.)

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Leaves shallowly 3-lobed or undivided, the leaf-stalks not glandular; flower-clusters 3/4 to 2 inches across, the flowers in a cluster all alike, small, perfect.

Leaves mostly undivided; flower-clusters 1½ to 2 inches across, borne on elongated upright branches; fruits purple-black, oval, the stone grooved ..... 1. *V. ellipticum.*

Leaves mostly 3-lobed; flower-clusters 3/4 to 1 inch across, borne on short lateral branchlets; fruits globose, slightly flattened, the stone not or scarcely grooved ..... 2. *V. pauciflorum.*

Leaves 3-lobed, the leaf-stalks with stalked glands near the top; flower-clusters 2½ to 4 inches across, with the center flowers small and a marginal row of enlarged sterile flowers; fruits scarlet ..... 3. *V. trilobum.*

1. OREGON VIBURNUM (*Viburnum ellipticum* Hook.).—Slender shrub 4 to 7½ feet high; leaves opposite, elliptic-oblong to broad-elliptic or roundish, thickish, very finely hairy below, at least on the veins, 1 to 2¾ inches long, 3- to 5-nerved from the base, the margins toothed above the base; flowers small, about 1/4 inch across, borne in more or less flat-topped clusters at the ends of the branches, the clusters 1½ to 2 inches across; berries purple-black, oval, nearly ½ inch long, with a single grooved stone.

Occurrence.—YOSEMITE, rare.

Fig. 138. Mooseberry viburnum (*Viburnum pauciflorum*).

2. MOOSEBERRY VIBURNUM (*Viburnum pauciflorum* Raf.), fig. 138.—Straggling shrub 2 to 6 feet high with smooth bark; leaves opposite, broadly oval to roundish, rounded at the base and usually with 3 broad lobes near the tip, smooth or somewhat hairy, the margins toothed; flowers small, white, borne in small clusters on short branchlets in the leaf-axils, the clusters about 3/4 to 1 inch across; berries nearly globose, somewhat flattened, about 1/3 inch long, red and translucent, quite tart, with a single flattened whitish stone. Where the plant is abundant, the berries were gathered and made into a sauce which was used as a substitute for cranberries.

Occurrence.—OLYMPIC. MOUNT RAINIER, rare: Ohanapecosh River near Cougar

Creek. GLACIER, occasional, 3,500 to 4,500 feet: Kintla Lake; Avalanche Lake; McDonald Valley below Avalanche Creek; along trail at upper end of St. Mary Lake. ROCKY MOUNTAIN, rare: East Inlet, above Grand Lake and below Mount Wescott, 9,000 feet. ISLE ROYALE, common in moist places: Mott Island; Passage Island.

3. AMERICAN CRANBERRYBUSH VIBURNUM (*Viburnum trilobum* Marsh), fig. 139.—Erect shrub up to 12 feet high, with smooth grayish branches; leaves opposite, broadly egg-shaped, 2 to 5 inches long, 3-lobed, the margins toothed, or sometimes the middle lobe elongated and not toothed, smooth above, nearly smooth below or hairy only on the veins, the leafstalks usually with stalked glands; flower-clusters showy, flat-topped, 2½ to 4 inches across, borne on short stalks; flowers white, the inner small and seed-producing, the outer marginal row enlarged and sterile; fruits globose or short-ellipsoid, red, about 1/3 inch long. (Syns. *V. americanum* Auth., not Mill.; *V. opulus* Am. auth., not L.).[46]

Occurrence.—ISLE ROYALE, occasional along streams and lake margins: Daisy Farm; islands in Lake Desor; flood plain of Washington River.

Fig. 139. American cranberry viburnum (*Viburnum trilobum*).

ELDER (*Sambucus* L.)

The elderberries are common shrubs in the western national parks, one or more species being found in each park. The plants favor moist locations along streams or moist slopes in open forests. The genus is easily recognized by the opposite leaves which are divided into separate leaflets, and by the dense clusters of small whitish flowers or dark blue or red berries at the ends of the branches. The berries of the blue- or black-fruited species are edible and are often gathered in great quantities for making pies and jellies or for elderberry wine. The berries of the red-fruited species are reputed to be poisonous, but are eaten by birds, small mammals, and bears. Indians made a decoction of the flowers to be used as a lotion and as an antiseptic wash. The inner bark yields a strong emetic.[47] The foliage furnishes good browse for deer and elk, especially in the Fall.

46 Rehder, Alfred, Manual of cultivated trees and shrubs hardy in North America; second edition, revised and enlarged, p. 842. 1940.

47 Range Plant Handbook B 144: United States Department of Agriculture, Forest Service, 1937.

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Flowers borne in large, flat-topped clusters; berries dark purple-blue.
- Leaflets 5 to 9, thickish, abruptly short-pointed.
  - Herbage smooth or very sparsely hairy ..... 1. *S. coerulea.*
  - Herbage finely hairy ..... 1a. Var. *velutina.*
- Leaflets 5 to 7, thinnish, gradually long-pointed ..... 1b. Var. *neomexicana.*

Flowers borne in round-topped or oblong clusters; berries red or black.
- Berries red; leaves light green, smooth except hairy sometimes along midrib.
  - Flower-clusters ovoid, the branches spreading or reflexed; pith brown ..... 2. *S. racemosa.*
  - Flower-clusters about as broad as long, the branches ascending; pith at first white or light brown.
    - Leaves often hairy on the midrib; occurs in parks of Northwest ..... 2. Var. *callicarpa.*
    - Leaves smooth; occurs in Sierra Nevada, Rocky Mountains, and Southwest ..... 2b. Var. *microbotrys.*
- Berries black; leaves dark green, hairy below when young ..... 3. *S. melanocarpa.*

1. BLUEBERRY ELDER (*Sambucus coerulea* Raf.). — Many-stemmed shrubs 6 to 10 feet high, or small trees up to 25 feet high; leaflets mostly 5 to 7 (or 9), oblong to narrowly lance-shaped, 1 to 6 inches long, dark green above, paler below, smooth, pointed at the tips, the margins coarsely toothed, unequal-sided at the base; flowers small, white, saucer-shaped, borne in flat-topped clusters sometimes 10 inches across; berries bluish-black with a whitish bloom. The berries are often gathered for making pies or jelly. (Syns. *S. glauca* Nutt., *S. coerulea* var. *arizonica* Sarg.).

Occurrence.—OLYMPIC. MOUNT RAINIER, common, 2,500 to 3,500 feet: Longmire; Nisqually Valley; White River near old camp. CRATER LAKE: near park headquarters; Crescent Ridge; southwest corner of park. YOSEMITE: near Awahnee Hotel. KINGS CANYON: near Sphinx Creek. SEQUOIA: near Ash Mountain. BRYCE CANYON: Rim Road north of Rainbow Mountain. ZION: near East Rim ranger cabin. GRAND CANYON, 6,500 to 8,500 feet. North Rim, occasional: along road to Cape Royale. South Rim and just below: along railroad west of Grand Canyon Village; Bright Angel trail about ½ mile below rim; Kaibab trail about 2 miles below rim.

1a. WHITELEAF BLUEBERRY ELDER (Var. *velutina* (Dur. & Hilg.) Schwer.).—Similar to the species but the young branchlets densely hairy and the leaflets finely hairy at least below. (Syn. *S. velutina* Dur. & Hilg., *S. californica* Koch.)

Occurrence.—LASSEN. YOSEMITE, 4,000 to 6,000 feet: Tenaya Lake trail; Nevada Falls; below Vernal Falls; Ledge trail. SEQUOIA, 6,000 to 7,000 feet: Kern River.

1b. NEW MEXICAN ELDER (Var. *neomexicana* (Woot.) Rehd.).—Tall shrubs up to 8 (or 21) feet high; branchlets smooth or finely hairy; leaflets 3 to 5, narrowly lance-shaped, grayish-green, slightly hairy below, gradually long-pointed, thinnish. (Syn. *S. neomexicana* Woot.)

Occurrence.—MESA VERDE: east end of Knife Edge road. GRAND CANYON.

AMERICAN ELDER (*Sambucus canadensis* L.) with shiny purple-black ber-

ries borne in flat-topped clusters has been reported from Isle Royale, but it has not been found recently.

2. EUROPEAN RED ELDER (*Sambucus racemosa* L.).—Tall shrub 4 to 10 feet high with light brown branchlets and smooth herbage; pith brown; leaflets 5 to 7, egg-shaped or elliptic to narrowly egg-shaped, 1¾ to 3½ inches long, long-pointed, rather coarsely toothed; flowers yellowish-white, borne in dense ovoid clusters 1½ to 2½ inches long; berries red.

Occurrence.—LASSEN. YOSEMITE, common, 6,500 to 11,000 feet: Crane Flat; Raymond Mountain; Tuolumne Meadows; Smedberg Lake; Isberg Lake trail; Johnson Peak. KINGS CANYON: East Lake. SEQUOIA, 8,500 to 11,800 feet: Kaweah Gap; Mount Guyot; Tuolumne Meadow; west of Black Rock Pass. ISLE ROYALE, common in the woods: near old Rock Harbor lighthouse; Sumner Lake; Washington Harbor.

2a. PACIFIC RED ELDER (Var. *callicarpa* (Greene) Jepson), fig. 140.—Spreading shrubs 6 to 15 feet high or small trees up to 20 feet high; leaflets light green, smooth except for fine hairs along the midribs below, 2 to 4 inches long, long-pointed at tips, the margins toothed; flowers creamy-white, borne in round-topped clusters 1½ to 3 inches across; berries bright red, the clusters becoming 5 inches across.

Occurrence.—OLYMPIC: creeks near Lake Crescent; Low Divide. MOUNT RAINIER, common, 3,500 to 5,000 feet: Stevens Canyon; Paradise Park. CRATER LAKE: Sun Meadows, 6,500 feet; Wizard Island, along shore.

Fig. 140. Pacific red elder (*Sambucus racemosa* var. *callicarpa*).

2b. BUNCHBERRY ELDER (Var. *microbotrys* (Rydb.) Kearn. & Peebles).—Shrubs 1 to 6 feet high with light brown bark and smooth herbage; leaflets 5 to 7, light green, egg-shaped to broadly lance-shaped, long-pointed at the tips, 1 to 4 inches long, the margins coarsely toothed; flowers yellowish-white, borne in round-topped clusters about 2 inches across, the clusters becoming larger and more spreading in fruit; berries bright red. (Syn. *S. microbotrys* Rydb.).

Occurrence.—GRAND TETON. YELLOWSTONE, reported. ROCKY MOUNTAIN. GRAND CANYON, on the North Rim.

3. BLACKBEAD ELDER (*Sambucus melanocarpa* Gray).—Spreading shrub up to 10 or 12 feet high, with reddish-brown branches; leaflets dark green, 5 to 7, oblong-lance-shaped, 3½ to 6 inches long, long-pointed, coarsely toothed, hairy below when young, becoming smooth; flowers yellowish-white, borne in broadly egg-shaped clusters 2 to 3 inches across, about as broad as high; berries black.

Occurrence.—GLACIER, common, 3,100 to 5,000 feet: foot of Lake McDonald; Avalanche campground; Swiftcurrent Lake; Swiftcurrent valley; Cut Bank valley; Bowman Lake; Kintla Lake. YELLOWSTONE: east entrance; west of Tower Junction; Mount Washburn road. GRAND TETON, 7,300 feet: north of Bear Paw Lake. GRAND CANYON: North Rim. Canyon on north side of the river.

SUNFLOWER FAMILY (Compositae)

FIELD GUIDE TO THE GENERA

A. LEAVES DIVIDED INTO LINEAR OR FILIFORM SEGMENTS.

Ray flowers present, yellow; herbage without sage odor.

Bracts of involucre about 5, egg-shaped; flowers with pappus composed of several papery scales ..... ERIOPHYLLUM, p. 230.

Bracts of involucre more than 5, linear; flowers with pappus of hair-like bristles.

Involucre cylindric, composed of a single series of equal erect bracts and several shorter spreading bracts below; pappus abundant, soft, white ..... SENECIO, p. 230.

Involucre hemispheric, composed of unequal bracts overlapping in several series; pappus scanty, brownish ..... *Aplopappus spinulosus* var. p. 249.

Ray flowers none: herbage with strong sage odor ..... ARTEMISIA, p. 230.

B. LEAVES NOT DIVIDED, OR IF SO, THE LOBES OR SEGMENTS NEVER LINEAR-FILIFORM.

Leaf-blades linear to narrowly oblong, spatula-shaped or wedge-shaped, not toothed, or with 2 or 3 teeth at the tip only.

Herbage with a strong sage odor ..... ARTEMISIA, p. 230

Herbage without sage odor.

Bracts of seed-bearing involucres winged with broad silvery scales; flowers greenish and inconspicuous ..... HYMENOCLEA, p. 234.

Bracts of involucres not changed in fruit; flowers yellow.

Involucre composed of 4 to 6 bracts.

Herbage dark green, smooth, the leaves and bracts with dark, ill-smelling oil glands ..... POROPHYLLUM, p. 234.

Herbage grayish-woolly, without ill-smelling oil glands ..... TETRADYMIA, p. 235.

Involucre composed of more than 6 bracts.

Flowers with pappus of papery scales; corollas yellow; leaves sticky-glutinous .....GUTIERREZIA, p. 236.

Flowers with pappus of hair-like bristles.

Stems mostly 4-angled; plants nearly leafless .....*Baccharis sergiloides*, p. 255.

Stems not 4-angled; plants leafy at least before flowering (nearly leafless in *Bebbia*).

Flowers yellow.

Heads cylindric to top-shaped; bracts of involucre herbaceous, sometimes thinnish but not papery nor fringed.

Bracts of involucre in more or less distinct vertical rows; ray flowers none.

Plants nearly leafless; heads with scales on receptacle between the flowers .....BEBBIA, p. 237.

Plants leafy at least before flowering; heads without scales on the receptacle ..CHRYSOTHAMNUS, p. 237.

Bracts of involucre not in distinct vertical rows; flower heads usually with 1 to several ray flowers (except in a few species) .....APLOPAPPUS, p. 243.

Heads spherical; involucral bracts papery, the margins fringed .....ACAMPTOPAPPUS, p. 249.

Flowers white or purplish-pink.

Tall, erect shrubs; flowers purplish-pink, the heads in small dense clusters at the ends of densely leafy branches .....PLUCHEA, p. 249.

Low, round-topped bushes; flowers white, the heads borne singly at the ends of sparsely leafy branches ..*Brickellia oblongifolia* var., p. 251.

Leaf-blades broader, oblong to egg-shaped or triangular, toothed or not toothed, or if narrow, then the margins always toothed or lobed.

Leaf-blades lance-shaped to broadly linear, the margins finely toothed, crowded near the ends of the smooth white stems .....*Brickellia longifolia*, p. 251.

Leaf-blades oblong or lance-shaped to egg-shaped or triangular.

Leaf-blades toothed or lobed (except sometimes *Trixis*); pappus present or none.

Leaves whitish or grayish with a fine felt, toothed or irregularly lobed, the margins often curled or crinkled; pappus scale-like or none.

Flowers greenish and inconspicuous; heads borne in the leaf-axils, in fruit becoming bur-like; pappus none .....FRANSERIA, p. 249.

Flowers white; heads borne in flat-topped clusters at the ends of erect flowering stems; heads not changing in fruit; pappus of papery scales .....PARTHENIUM, p. 250.

Leaves green, sometimes hairy but not woolly; pappus of hair-like bristles.

Leaf-blades broadly lance-shaped to egg-shaped or triangular.

Corollas yellow, 2-lipped; involucre composed of a single series of equal bracts and several broad leaf-like bracts below; leaves not toothed or few-toothed..... TRIXIS, p. 250.

Corollas white or pinkish, not 2-lipped; involucre composed of unequal bracts overlapping in several series; leaves toothed ..... BRICKELLIA, p. 251.

Leaf-blades oblong to lance-shaped, toothed or lobed.

Ray flowers none; heads white or yellow.

Flowers white, the male and female heads borne on separate plants ..... BACCHARIS, p. 253.

Flowers yellow, the heads all alike ..... APLOPAPPUS, p. 243.

Ray flowers conspicuous, purple, the center flowers yellow..... ASTER, p. 255.

Leaf-blades not toothed; flowers yellow; pappus none or rarely with 2 slender hairs; low round-topped shrubs ..... ENCELIA, p. 255.

GOLDEN YARROW ERIOPHYLLUM (*Eriophyllum confertiflorum* Gray).—Plants ¾ to 2 feet high with white-woolly herbage; stems woody at the base; leaves 1/3 to 1 inch long, divided into 3 to 7 linear divisions, crowded on the stems, especially below; flower heads yellow, composed of several central disk flowers surrounded by 4 or 5 petal-like ray flowers (the latter sometimes lacking), borne in compact, often head-like clusters at the ends of the stems; seed-like fruits (achenes) nearly linear, each with a ring of about 8 chaffy scales at the top.

Occurrence.—YOSEMITE: Wawona, 5,000 feet.

DOUGLAS GROUNDSEL (*Senecio Douglasi* DC.).—Widely branched bush 2 to 6 feet high, the stems densely covered with leaves; leaves 1 to 3 inches long, divided into several linear divisions, at first white-woolly, later becoming green; flowers yellow, borne in narrowly bell-shaped heads with a series of petal-like ray flowers on the outside; involucre composed of a single inner row of linear bracts of about equal length tightly surrounding the head and an outer series of short spreading bracts; seed-like fruits (achenes) with a brush of soft white hairs or bristles at the top.

Occurrence.—YOSEMITE, up to about 4,000 feet.

SAGEBRUSH, WORMWOOD (*Artemisia* L.)

There are several widely different forms of sagebrush represented in the parks, but all are easily recognized by the silvery-gray color of the foliage and by the strongly aromatic or "sagey" odor which is so familiar. All the species are of some value as browse, some being of more use than others. Big sagebrush is especially widespread and important as food for deer. It is said that cattle in the sagebrush country often acquire a "sage hunger" and may feed on sagebrush alone for several days or until this hunger is appeased. The largest areas covered by big sagebrush are in the dry plains or plateau regions where it commonly occurs in pure stands. The leaves and twigs of most of the species have a peculiar bitter-aromatic quality which gives them the reputation of having tonic properties. A decoction of the leaves and twigs was used medicinally by the Indians of certain regions.

FIELD GUIDE TO THE SPECIES

Leaves mostly twice-divided along the sides into very narrow or linear segments; plants 1/3 to 1½ feet high, sometimes herb-like ..... 1. *A. frigida.*

Leaves not divided nor toothed, or, if so, cleft or toothed at the tips.

Leaves more or less wedge-shaped, mostly toothed or cleft at the tips, but not usually divided more than half.

Flower heads with only 2 to 4 flowers; leaves 1/3 to 1 inch long, toothed or untoothed; found at Grand Canyon National Park ..... 2. *A. Bigelovi.*

Flower heads, 3- to 20-flowered; leaves 3- to 5-toothed at the tips, 2/3 to 2 inches long ..... 3. *A. tridentata.*

Leaves or leaf-segments linear or filiform, ½ to 3½ inches long, rarely with 1 or 2 irregular teeth in *A. cana;* plants 1 to 4 feet high.

Leaves often divided their length into linear divisions; flowers 3 to 9 in a head ..... 4. *A. filifolia.*

Leaves mostly not toothed nor divided; flowers 6 to 15 in a head ..... 5. *A. cana.*

1. FRINGED SAGEBRUSH (*Artemisia frigida* Willd.).—A low shrub about 1/3 to 2 feet high (often herb-like); stems freely branching from the base, spreading below, with erect annual branches; herbage very fragrant; leaves silvery hairy, about ½ to ¾ inch long, deeply twice divided into linear lobes so as to appear fringed around the edges; flower heads rather conspicuous, broad and flattish, brownish or yellowish, nodding, borne in narrow somewhat leafy clusters 4 to 12 inches long (or much dwarfed).

This is one of the most widespread species of sagebrush in our western parks. The scientific name *frigida,* refers to the frigid regions of eastern Siberia where the plant was first discovered. In the Rocky Mountain region it ranges from semi-desert valleys up to 11,000 feet and is one of the important sources of winter feed for elk in the Jackson Hole country of Wyoming. This plant was used by the Indians and early pioneers in decoctions for the treatment of colds or as a mild cathartic. The Blackfeet Indians[48] chewed the leaves as a remedy for heartburn.

Occurrence.—GLACIER, rare: rocky flats about St. Mary Lake; Glacier Park station. YELLOWSTONE, abundant, up to 8,000 feet: Tower Falls; Mammoth; Upper Geyser Basin; Old Faithful. GRAND TETON, common. ROCKY MOUNTAIN, abundant: in rocky ground throughout the park. MESA VERDE: Morfield Canyon, 7,500 feet. BRYCE CANYON, occasional: checking station, 7,500 feet; White Man's Springs. GRAND CANYON, rare on the North Rim on rocky points; Point Sublime; Point Imperial.

2. BIGELOW SAGEBRUSH, SLENDER SAGEBRUSH (*Artemisia Bigelovi* Gray.).—A low shrub commonly 2/3 to 1 1/3 feet high with a faintly pleasant odor; stems many, spreading below, with numerous slender erect flowering branches; leaves silvery hairy, narrowly wedge-shaped, tapering to a narrow base, 1/3 to 1 inch long, sharply 3-toothed at the tip, or many without teeth; flowers yellow, 2 to 4 in a head, the heads borne in long narrow clusters with

48 Standley, P. C., Flora of Glacier Park: Contributions from the United States National Herbarium, vol. 22, pt. 5, p. 433. 1921.

or without short nodding branches; occurs on rocky banks and in mountain canyons in the Southwest.

Occurrence.—GRAND CANYON, rare on the North Rim: Point Sublime; Grama Point; Lauzon Ranch.

Fig. 141. Big sagebrush (*Artemisia tridentata*).

3. BIG SAGEBRUSH (*Artemisia tridentata* Nutt.), fig. 141.—Shrub 1 to 12 feet high, with a definite trunk or with several trunk-like branches; herbage silvery-gray or whitish with dense but thin fine hairs; bark dark brown or nearly black, shreddy; leaves narrowly wedge-shaped, 2/3 to 2 inches long, usually 3-toothed (or sometimes 4- or 5-toothed) at the tip; flowers mostly 4 to 6 (or 9), borne in small heads surrounded at the base by a close cup of finely hairy overlapping scales; heads yellowish or brownish, borne in rather loose clusters 1 to 4 inches across.

This is one of the most common and familiar of western shrubs and becomes the largest of the western sagebrushes. It is a very variable species with numerous varieties, many of which are often recognized as distinct species. Big sagebrush occurs commonly on dry plains but may also be found in dry open forests, particularly in the Southwest where it grows luxuriantly. The species is generally known as an indicator of deep soils largely free from alkali. The plant furnishes an important fuel in the regions where it is common. The stringy bark is easily ignited and the burning wood produces an intense heat. The fruits were pounded by the California Indians to make pinole, a kind of a flour.

FIELD GUIDE TO THE VARIETIES

Plants 1 to 12 feet high; leaves 2/3 to 2 inches long, mostly 3-toothed at tip; flower clusters loosely branched, 1 to 4 inches broad; heads mostly 4- to 6-flowered; widespread .....3. *A. tridentata.*

Plants 1/3 to 4 feet high; flower clusters often spike-like, about 1/5 to 1 inch broad. Leaves, or some of them 3-toothed at tip (not cleft).

Plants ½ to 2 feet high; leaves ½ to 2 inches long, often without teeth; flowers mostly 7 to 20 in a head; found in Sierra Nevada parks of California ..... 3a. Var. *Rothrocki.*

Plants 1/3 to 1 foot high; leaves 1/5 to ¾ inch long; flowers 3 to 5 in a head; found in Rocky Mountain and Southwest parks ..... 3b. Var. *nova.*

Leaves, or some of them, 3- to 5-cleft, sometimes about ½ their length, into narrow or linear divisions.

Leaves 3- to 5-cleft; flowers mostly 5 to 9 in a head ..... 3c. Var. *arbuscula.*

Leaves 3-cleft; flowers mostly 3 to 5 in a head ..... 3d. Var. *trifida.*

Occurrence (*A. tridentata* Nutt.).—CRATER LAKE: near shore of Crater Lake east of the Wineglass. LASSEN. YOSEMITE, common, 4,200 to 10,500 feet: Yosemite Valley, along the trails to Glacier Point; Tenaya Canyon; Snow Creek; south of Spiller Lake; Spiller Canyon across from Red Mountain; west of Surprise Lake; above Fletcher Lake. KINGS CANYON: near Sphinx Creek; Bubbs Creek. SEQUOIA, abundant, 4,000 to 10,000 feet: Little Kern River; Mineral King; between Big Arroyo and Chagoopa Plateau. GLACIER, rare: along North Fork Flathead River road at Round Prairie and near Big Prairie. YELLOWSTONE, common up to 7,000 feet: meadow near Dragon's Mouth; hills north of Rainey Lake; north of Tower Falls; Hayden Valley; Gardiner. GRAND TETON, occasional, 6,600 to 9,500 feet. ROCKY MOUNTAIN, 8,000 to 9,800 feet: south and west slopes of Deer Mountain; Horseshoe Park; Glacier Basin; southwest of Mount Bryant; Grand Lake. MESA VERDE, common, 6,000 to 8,000 feet: near Far View House. BRYCE CANYON, 6,700 to 8,000 feet. ZION: north of Potato Hollow, 6,800 feet. GRAND CANYON, 6,000 to 7,600 feet. North Rim, occasional: Powell Plateau; Cape Royal. South Rim, abundant: 2 miles south of Yaki Point; Rowe Well; Pasture Wash; along road between Grand Canyon Village and Desert View. Canyon, just below South Rim.

3a. ROTHROCK SAGEBRUSH (Var. *Rothrocki* (Gray) McMinn).—Similar to big sagebrush but the plants smaller (½ to 2 feet high) and the flower clusters form narrow spikes not usually more than 1 inch across; leaves narrowly wedge-shaped, often with 3 teeth at the tip, ½ to 2 inches long; flower heads oval, larger and with more flowers (usually 7 to 20) than in big sagebrush, borne singly or in close bunches along the erect flowering stems; found on dry plains and plateaus in the high mountains. (Syn. *A. Rothrocki* Gray.)

Occurrence.—YOSEMITE, occasional, 8,500 to 10,500 feet: Mono Pass; west slope of Mount Gibbs; southwest of Grouse Lake; Crescent Lake; near Irving Bright Lake; Matterhorn Canyon; near Ireland Lake; east of Mount Florence; Mount Dana. SEQUOIA: Siberian Outpost, 10,500 feet; near Whitney Meadows; Chagoopa Plateau.

3b. BLACK SAGEBRUSH (Var. *nova* (Nels.) McMinn).—Similar to big sagebrush but much smaller; low shrub, usually 1/3 to 1 foot high, with numerous erect branches from a spreading base; leaves finely silvery hairy, 1/5 to ¾ inch long, 3-toothed at the tip; flower heads light brownish, borne in narrow clusters about ¼ to 1 inch broad; occurs on hillsides, ridges and plateaus, mostly in sandy or gravelly soils and is often one of the most common and abundant undershrubs of the Southwest at fairly high elevations. (Syn. *A. nova* Nels.).

Occurrence.—ROCKY MOUNTAIN. BRYCE CANYON. GRAND CANYON.

3c. SCABLAND SAGEBRUSH, LOW SAGEBRUSH (Var. *arbuscula* (Nutt.) McMinn).—Similar in appearance to dwarf forms of big sagebrush; low shrub 1/3 to 1 1/3 feet high; branches stiff and irregular, the lower often with

spine-like tips; twigs slender, erect, silvery with fine gray hairs; leaves mostly wedge-shaped or somewhat fan-shaped, 3/4 inch long or less, with 3 to 5 teeth at the tip, the teeth often 1/3 inch long; flower heads brownish-yellow, mostly 5 to 9-flowered, borne in long narrow clusters, with or without short branches; occurs on dry rocky hillsides and plains at higher elevations. (Syn. *A. arbuscula* Nutt.)

Occurrence.—YELLOWSTONE: along Yellowstone River below Yellowstone Lake. GRAND TETON, in rocky locations on exposed mountain sides. ROCKY MOUNTAIN. MESA VERDE.

3d. THREETIP SAGEBRUSH (Var. *trifida* (Nutt.) McMinn).—Very similar to scabland sagebrush; leaves 3-cleft into linear divisions; flowers mostly 3 to 5 in a head. (Syn. *Artemisia tripartita* Rydb.).

Occurrence.—YELLOWSTONE: Upper Geyser Basin. GRAND TETON: common around Jackson Hole. ROCKY MOUNTAIN. ZION.

4. SAND SAGEBRUSH (*Artemisia filifolia* Torr.).—A round-topped shrub, 1 to 4 feet high, the twigs and herbage covered with fine white hairs; bark of older stems smooth, dark gray or blackish; leaves very narrowly linear or filiform, 1 to 3 1/2 inches long, the lower sometimes divided into long linear divisions; flower heads yellowish, crowded in dense narrow leafy clusters 4 to 12 inches long.

Occurrence.—ZION.

5. SILVER SAGEBRUSH (*Artemisia cana* Pursh).—Low, silvery-gray or yellowish-green shrub commonly 1 to 3 feet high (sometimes 5 feet), with pungent turpentine-like odor; stems freely branching, forming rounded bushes; older stems with dark brown fibrous bark; leaves silky-hairy, 2/3 to 1 (or 2) inches long, narrow with pointed tips, sometimes with 1 or 2 irregular teeth; flower-heads yellowish, borne in narrow leafy clusters 5 to 12 inches long, 2/3 to 2 inches wide; occurs usually in more or less moist and sheltered sites on the plains or in mountain valleys.

Occurrence.—GLACIER, rare: plains around the east entrance. YELLOWSTONE, abundant: near east entrance; Canyon Camp; meadow near Lake ranger station; Hayden Valley. ROCKY MOUNTAIN, rare: Southwest of Mount Bryant, 8,500 feet. ZION: The Narrows.

WHITE BURROBRUSH (*Hymenoclea salsola* Torr. & Gray).—Diffusely branched shrub 1 to 3 feet high with a grayish-white aspect; leaves about 3/4 to 1 1/2 inches long, linear or the lower divided into slender filiform divisions; male and female flowers borne in separate heads, the female heads surrounded by an involucre composed of 6 roundish, silvery-papery scales often 1/4 inch across.

Occurrence.—ZION. GRAND CANYON.

SLENDER PORELEAF (*Porophyllum gracile* Benth.).—Widely branching, ill-smelling plant about 1 to 2 1/2 feet high, the stems woody only at the base;

herbage dark green; leaves linear, about ½ to 1½ inches long, smooth; flower heads borne singly, about ⅜ to ½ inch high, the flowers few, yellow; petal-like ray flowers none; bracts of involucre few, borne in one series, oblong, dotted with dark-colored oblong oil glands; seed-like achenes linear; pappus composed of rough hair-like bristles.

Occurrence.—GRAND CANYON, common in the canyon, 3,000 to 4,000 feet: Kaibab trail below the Tonto; Bright Angel trail along Pipe Creek; Kaibab trail along Bright Angel Creek.

HORSEBRUSH (*Tetradymia* DC.)

FIELD GUIDE TO THE SPECIES

Plants not spiny; flower heads borne in more or less flat-topped clusters at the ends of the stems; seed-like fruits (achenes) smooth or thinly hairy ..... 1. *T. canescens* var. *inermis*.

Plants spiny; flower heads borne along the stems in the leaf-axils.

Stems densely white-felty; seed-like achenes densely soft white-hairy, the hairs nearly as long as the tufts of white pappus bristles, the heads thus appearing as soft cottony balls ..... 2. *T. spinosa*.

Stems white cottony or woolly; seed-like achenes densely hairy, but the hairs much shorter than the tuft of pappus bristles ..... 3. *T. axillaris*.

1. SPINELESS GRAY HORSEBRUSH (*Tetradymia canescens* DC. var. *inermis* Gray).—Densely branched shrub 1/3 to 2 feet high with white felty herbage; leaves about ¼ to ½ inch long, linear or with broader tips, densely white-felty, bunched at the stem joints; flowers yellow, about 4 to a head, surrounded by 4 or 5 involucral bracts; heads about ½ inch high, borne in compact more or less flat-topped clusters at the ends of the stems; seed-like fruits (achenes) smooth or thinly hairy, each with a tuft of grayish bristles (pappus) at the tip. It is reported that the Hopi Indians use the stems and roots as a tonic.

Occurrence.—YELLOWSTONE. MESA VERDE. BRYCE CANYON, common along the rim: Sunset Point; near Inspiration Point. ZION.

2. COTTON THORN (*Tetradymia spinosa* H. & A.).—Rigidly branched spiny shrub, about 2 to 4 feet high, with white-felty stems; spines straight or curved, ¼ to 1½ inches long, rather crowded along the stems; leaves linear, broadening slightly at the tips, bunched in the axils of the spines; flowers yellow, usually 6 to 7 in a head surrounded by 5 or 6 involucral bracts, the heads borne on short stems in the axils of the leaves, appearing as small cottony balls because of the long, soft, white hairs on the seed-like achenes.

Occurrence.—ZION: near western park boundary on road to Petrified Forest.

3. LONGSPINE HORSEBRUSH (*Tetradymia axillaris* Nels.).—Spiny shrub up to about 2½ or 3 feet high; stems white-fuzzy or finely woolly but not covered with a dense felt, the upper tending to be bunched and broom-like; spines straight, rigid, ¾ to 1¾ inches long, at first somewhat white-woolly; leaves linear, ¼ to ½ inch long, green, somewhat fleshy, bunched in the axils of the

spines; flowers yellow, borne in heads of about 5 surrounded by an involucre of 5 bracts; bracts about 1/3 inch long, smooth; seed-like fruits (achenes) densely hairy, but the hairs much shorter than the tuft of long hair-like bristles (pappus) at the tip; heads borne singly in the axils of the leaves.

Occurrence.—ZION: hill at mouth of Coalpits Wash, 4,000 feet.

SNAKEWEED (*Gutierrezia* Lag.)

FIELD GUIDE TO THE SPECIES

Bushes broom-like; stems densely leafy, the leaves somewhat sticky; ray and disk flowers 3 to 7 each ..... 1. *G. sarothrae.*

Stems straggling, more sparsely leafy, the leaves very sticky; ray and disk flowers 1 or 2 each ..... 2. *G. lucida.*

Fig. 142. Broom snakeweed (*Gutierrezia sarothrae*).

1. BROOM SNAKEWEED (*Gutierrezia sarothrae* Britt. & Rusby), fig. 142. — Low bushy plant, 1 to 2 feet high, with numerous erect stems from a woody base; leaves linear, 1 to 2 inches long, somewhat sticky-resinous, thickly clothing the branches; flowers yellow; flower heads small, narrowly cylindric, composed of 3 to 7 petal-like ray flowers and 3 to 7 tubular disk flowers, several heads borne in loose, more or less flat-topped clusters at the ends of the stems; seed-like achenes silky, tipped with a circle of small papery scales.

This is one of the common shrubs in the dry, semi-desert areas in the Southwest and extending northward into the Great Basin region. The plant, which is quick to come into burned areas or into areas which have been depleted of vegetation due to over-grazing or drought, serves as a valuable protection against erosion. It is generally considered worthless as forage, but is sometimes browsed when other food is scarce. It has been reported, in some instances, to be poisonous to livestock.

Occurrence.—YELLOWSTONE. GRAND TETON. MESA VERDE. BRYCE CANYON. ZION: hills around Coalpits Wash, 4,000 feet. GRAND CANYON. South Rim, occasional: Grand

Canyon village; trail from El Tovar to Yavapai Point. Canyon, abundant: Bright Angel trail; Kaibab trail on both sides of the Colorado River; Phantom Ranch.

2. STICKY SNAKEWEED (*Gutierrezia lucida* Greene).—Straggling shrub 1 to 1½ feet high; similar to broom snakeweed but with very sticky herbage; stems only sparsely leafy; ray and disk flowers 1 to 3 each, the heads surrounded by a very narrowly cylindric involucre. (Syns. *Gutierrezia glomerella* Greene, *G. microcephala* (DC.) Gray.)

Occurrence.—ZION: reported. GRAND CANYON. North Rim: Powell Saddle. South Rim: east of Grand Canyon Village.

RUSH BEBBIA (*Bebbia juncea* (Benth.) Greene).—Rounded bushy shrub 1 to 4 feet high, with almost leafless rush-like branches; leaves linear, ½ to 1½ inches long, alternate or the lower opposite; flowers yellow; ray flowers none; heads about 1/3 inch high, the involucral bracts lance-shaped, unequal and over-lapping in several series, the outer somewhat fuzzy-hairy; heads with papery scales on the receptacle between the flowers; seed-like achenes linear to top-shaped, densely hairy, crowned with a pappus of hair-like bristles as long as the corolla.

Occurrence.—GRAND CANYON, in the canyon, 2,500 feet: Phantom Ranch.

RABBITBRUSH (*Chrysothamnus* Nutt.)

Many species of rabbitbrush are found in the western United States, the species being most abundant in the open forests or in the dry open sagebrush country. The plants are ordinarily rather unattractive and straggly looking until late summer when the bushes become covered with numerous heads of golden yellow flowers. This character is suggested by the generic name, *Chrysothamnus*, from the Greek *chrysos,* meaning gold, and *thamnos,* a shrub. In this and other respects the rabbitbrushes resemble many of the goldenbushes, *Aplopappus*, from which they may be distinguished by the bracts of the involucre which are usually ridged down the back and arranged in vertical rows. Also, the flower heads of rabbitbrush lack ray flowers present in most of the goldenbushes. The seed-like achenes are crowned by numerous soft white pappus hairs. Some of the species are browsed to a certain extent during the Fall or when other food is scarce. Sometimes the bushes are leafless during most of the year. The flowers of certain species were used by the Navajo Indians for making a yellow dye for their wool.

FIELD GUIDE TO THE SPECIES

Stems covered with a dense greenish or whitish felt, at least when young.

Bracts of involucre rather loosely arranged, the outer with slender green herbaceous tips; flower clusters narrowly oblong, leafy .....1. *C. Parryi.*

Bracts of involucre arranged in more distinct vertical ranks, the tips not green-herbaceous; flower clusters mostly more or less flat-topped (elongated in var. *consimilis*) .....2. *C. nauseosus.*

Stems smooth or finely fuzzy or hairy, not felty.

Bracts of involucre in sharply defined vertical rows; achenes smooth or only minutely hairy.

Leaves spatula-shaped to reverse-lance-shaped, up to 2 mm. wide; flower heads small, about 3/8 inch high; low shrubs mostly 4 to 12 inches high ..... 3. *C. depressus.*

Leaves narrowly linear or filiform; flower heads large and showy, about 1/2 inch high; shrubs 1 to 3 feet high ..... 4. *C. pulchellus.*

Bracts of involucre not in sharply defined vertical rows; achenes mostly densely hairy.

Bracts of involucre short-pointed ..... 5. *C. viscidiflorus.*

Bracts of involucre (or some of them) with long slender points ..... 6. *C. Greenei.*

1. PARRY RABBITBRUSH (*Chrysothamnus Parryi* (Gray) Greene).—Shrub 2/3 to 2 feet high, the branches densely covered with white or rarely greenish wool when young, later becoming smooth and yellowish-green; bark of main stems brown and stringy; leaves narrowly to broadly linear or sometimes broader above the middle, pointed at the tip, 3/4 to nearly 3 inches long, usually exceeding the flower cluster, 1- to 3-nerved, only one nerve prominent; flower heads erect, borne in narrowly oblong leafy clusters; flowers 10 to 20 in a head (or fewer in some varieties); involucre 1/3 to 1/2 inch high (or higher in some varieties); bracts of involucre in more or less obvious vertical rows, papery, the outer with slender green herbaceous tips; seed-like achenes 4-angled, covered with appressed hairs; occurs on hills and in dry valleys at medium high elevations in the Rocky Mountains and in the Southwest.

FIELD GUIDE TO THE VARIETIES

Leaves mostly 1 to 3 1/2 inches long; flowers mostly 10 to 20 in a head ..... 1. *C. Parryi.*

Leaves 1/2 to 1-3/5 inches long; flowers mostly 5 to 7 (or 11) in a head.

Leaves very narrow, 1/8 inch or less wide.

Involucres 1/2 to 5/8 inch high, the bracts tending to be recurved at the tips ..... 1a. Var. *nevadensis.*

Involucres 3/8 to 1/2 inch high, the bracts usually straight and erect at the tips.

Bracts of involucres 13 to 20, rather strongly keeled, the vertical rows obvious ..... 1b. Var. *attenuatus.*

Bracts of involucres 9 to 12, not strongly keeled, the vertical rows rather obscure. ..... 1c. Var. *vulcanicus.*

Leaves mostly 1/6 inch or more wide; rare species known only from Mono Pass on eastern boundary of Yosemite National Park ..... 1d. Var. *Bolanderi.*

Occurrence (*C. Parryi*).—ROCKY MOUNTAIN, rare, 7,200 to 8,500 feet: western boundary of park; 2 miles southwest of Mount Bryant. MESA VERDE. ZION, Coalpits Wash, 3,600 feet.

1a. NEVADA RABBITBRUSH (Var. *nevadensis* (Gray) Jepson).—Usually smaller than the species; leaves 1/2 to 1 1/2 inches long, 1-nerved; flowers mostly 5 to 7 in a head, involucre 1/2 to 5/8 inch high, the bracts tending to be recurved at the tips.

Occurrence.—LASSEN. GRAND CANYON, reported from the South Rim: Long Jim Canyon, south of Shoshone Point, 6,800 feet.

1b. NARROWLEAF RABBITBRUSH (Var. *attenuatus* (Jones) Hall).—Low

shrubs, the leaves green and somewhat sticky, not fuzzy; wool on stems whitish or greenish; bracts of involucre 13 to 15, with slender, usually erect tips; flowers 5 to 7. (Syn. *Chrysothamnus Newberryi* Rydb.).

Occurrence.—BRYCE CANYON, common.

1c. VOLCANO RABBITBRUSH (Var. *vulcanicus* (Greene) Jepson).—Small shrubs usually about 6 or more inches high; herbage green, somewhat sticky; leaves linear, the upper scarcely equalling the flower clusters; flower heads numerous, borne in long narrow clusters; flowers 5 to 7 in a head; bracts of involucre 9 to 12, thin with straight pointed tips.

Occurrence.—KINGS CANYON: Kings River Canyon.

1d. BOLANDER RABBITBRUSH (Var. *Bolanderi* (Gray) Hall.)—This variety is similar in appearance to *Aplopappus macronema* because of the densely white-woolly stems and the rather broadly lance-shaped leaves, but the heads are narrower and the bracts of the involucre keeled and arranged in vertical rows. In *Aplopappus* the bracts are flatter, broader, and more loosely arranged, not in vertical rows. From typical specimens of *C. Parryi* this variety differs in having fewer flowers, only 5 to 11 in a head, and in having wider leaves which are thick and rigid. Bolander rabbitbrush is known only from the type locality.

Occurrence.—YOSEMITE, rare at the eastern boundary of the park, 9,000 to 10,000 feet: Mono Pass.

2. RUBBER RABBITBRUSH (*Chrysothamnus nauseosus* (Pallas) Britt.), fig. 143.—Round-topped bushes, 1½ to 8 feet high (rarely tree-like), the stems whitish or grayish-cottony or felty; leaves 1 to 2½ inches long, broadly-linear to narrowly-filiform, cot-

Fig. 143. Rubber rabbitbrush (*Chrysothamnus nauseosus*).

tony or nearly smooth; flowers yellow, covering the bushes with golden color during the summer; flower heads borne in dense, spreading, usually flat-topped or rounded clusters; bracts of involucre arranged in distinct vertical rows.

The common name comes from the fact that the plants have a high rubber content. They have been shown to contain a fairly high grade of rubber which vulcanizes easily. The species occurs commonly on alkaline soil. The herbage is not ordinarily palatable to animals, probably because of the disagreeable rubbery taste. The Indians of certain areas used the plant to make a crude chewing gum.

FIELD GUIDE TO THE VARIETIES

Twigs usually densely leafy; flower clusters flat-topped, rounded, or elongated; achenes densely hairy.
- Bracts of involucre gradually pointed or blunt, not abruptly pointed.
  - Involucres somewhat hairy or fuzzy (at least the shorter outer bracts); plants about 2/3 to 2 feet high, usually rounded.
    - Involucres mostly 1/4 to 1/3 inch high, the bracts blunt, not strongly ridged on the back; plants woody only at base ..... 2. *C. nauseosus.*
    - Involucres mostly 1/3 to 2/3 inch high, the bracts pointed, strongly ridged on the back; plants distinctly shrubby ..... 2a. Var. *speciosus.*
  - Involucres smooth, the bracts pointed, ridged on the back; shrubs commonly 2 to 5 feet high, taller than broad.
    - Flower clusters rounded or flat-topped ..... 2b. Var. *graveolens.*
    - Flower clusters elongated or cylindric ..... 2c. Var. *consimilis.*
  - Bracts of involucre abruptly pointed; occurs only in California parks ..... 2d. Var. *occidentalis.*

Twigs rush-like, leafless or very sparsely leafy; flower clusters flat-topped; achenes hairy or smooth; species of the Southwest.
- Shrubs 2 to 3 feet high; bracts of involucre pointed, smooth; achenes densely hairy ..... 2e. Var. *junceus.*
- Shrubs about 1 foot high; bracts of involucre blunt, margins hairy, the backs fuzzy; achenes smooth ..... 2f. Var. *glareosus.*

Occurrence (*C. nauseosus*).—YELLOWSTONE, rare: Gardiner; Mammoth Hot Springs; Tower Falls. GRAND TETON. GRAND CANYON. South Rim. Canyon: Bright Angel trail along Garden Creek; Kaibab trail about 1 mile below South Rim; Bright Angel Creek several miles above Phantom Ranch.

2a. TALL RABBITBRUSH (Var. *speciosus* (Nutt.) Hall).—Shrubs mostly about 1½ feet high; leaves 2/3 to 2 1/3 inches long, up to 1/8 inch wide, 1-nerved; heads borne in more or less rounded or somewhat elongated spreading clusters at the ends of the branches; involucres 1/3 to 2/5 inch high, the bracts pointed, strongly ridged down the backs; seed-like achenes densely hairy.

Occurrence.—CRATER LAKE: Pumice Point; around the lake at about 8,250 feet. YOSEMITE, 4,000 to 9,000 feet: south of Mather (near park); Mono Pass. YELLOWSTONE.

2b. GREENPLUME RABBITBRUSH (Var. *graveolens* (Nutt.) Piper).—

Shrub commonly 2 to 5 feet high; herbage felty only when young; leaves smooth and green, 1 to 2½ inches long; flower clusters rounded or flat-topped, the heads crowded; involucres ¼ to 1/3 inch high, the bracts smooth, pointed, ridged down the back; achenes hairy; occurs in canyons and on dry hills bordering the deserts. A tea made from the leaves was used by the Indians to relieve coughs and pains in the chest.

Occurrence.—GRAND TETON. ROCKY MOUNTAIN: Cache La Poudre Creek. MESA VERDE: 7,200 feet. ZION, 3,500 to 5,000 feet: Coalpits Wash; switchbacks below Zion tunnel. GRAND CANYON, on the South Rim: rim drive; Desert View.

Variety *abbreviatus* (Jones) Blake, found on the south side of the Grand Canyon, is similar, but with shorter leaves, which are often reduced and scale-like, and with smooth achenes.

2c. Var. *consimilis* (Greene) Hall.—Erect shrub, 2 to 5 feet high; twigs very leafy, the felt greenish; leaves nearly filiform, 1 to 2 inches long; flower cluster pyramidal or cylindric; involucre about ¼ inch high; bracts pointed, ridged on the back, smooth; achenes densely hairy.

Occurrence.—YELLOWSTONE: Tower Falls.

2d. WESTERN RUBBER RABBITBRUSH (Var. *occidentalis* (Greene) Hall).—Low shrub with numerous short erect branches; twigs grayish-woolly; leaves mostly narrowly linear or filiform and not usually more than 1¾ inches in length; flower cluster densely round-topped, 1 to 2 inches across; involucres ¼ to 1/3 inch high.

Occurrence.—LASSEN. YOSEMITE, 4,000 feet: Yosemite Valley; south of Mather (near park). SEQUOIA, in rocky places up to 9,500 feet: Little Kern River; Big Arroyo; Kaweah River Basin.

2e. BROOM RABBITBRUSH (Var. *junceus* (Greene) Hall).—Bushy shrub 2 to 3 feet high with erect broom-like branches; stems covered with a yellowish-green felt; leaves smooth, linear-filiform, soon falling from the stems and leaving them leafless and rush-like at flowering time; flower heads borne in dense, more or less flat-topped clusters; involucres about 2/5 inch high, the bracts pointed, smooth.

Occurrence.—ZION. GRAND CANYON, up to 7,000 feet. South Rim, common: rim drives; Pasture Wash. Canyon: Bright Angel trail.

MOHAVE RABBITBRUSH (Var. *mohavensis* (Greene) Hall) is a form closely resembling broom rabbitbrush, especially as the plants are often leafless and broom-like. The main distinction is supposed to be in the corolla-lobes which are hairy in var. *junceus* but smooth in var. *mohavensis*. This variety is reported from Zion and Grand Canyon National Parks.

2f. SHOWY RABBITBRUSH (Var. *glareosus* (Jones) Hall). — Many stemmed shrub about 1 foot high; stems sparsely leafy; leaves linear, slightly widened above; flower cluster flat-topped; involucre about 2/5 inch high; bracts blunt, somewhat ridged and fuzzy on the backs, the margins somewhat gnawed and hairy; achenes smooth.

Occurrence.—GRAND CANYON: Little Colorado River and perhaps in the park.

3. DWARF RABBITBRUSH (*Chrysothamnus depressus* Nutt.). — Dwarf shrub, 1/3 to 1 foot high, usually with whitish branches and leaves; leaves short, thickish, narrowly oblong to lance-shaped, 1/6 to ¾ inch long, rather sharp-pointed; flowering heads about ⅜ inch high, few-flowered (about 5 in a head), borne in flat or round-topped clusters; bracts of involucre boat-shaped, short-pointed, arranged in 5 sharply defined vertical rows: achenes more or less 4-angled, tapering to the base, smooth or obscurely hairy towards the summit; occurs only in parks of the Southwest. This species is often closely browsed, but it is not usually found in great abundance.

Occurrence.—MESA VERDE: head of old Switchback road, 8,100 feet. GRAND CANYON. South Rim, about 7,000 to 7,500 feet: 2 miles south of Moran Point; Grand View. Canyon: Bright Angel trail.

4. SOUTHWEST RABBITBRUSH (*Chrysothamnus pulchellus* (Gray) Greene).—Similar in appearance to dwarf rabbitbrush; differs in having narrower filiform leaves and in having somewhat larger flowers (about ½ inch high); the heads in fruit appearing as tiny brooms because of the long, straw-colored pappus bristles (sometimes nearly ½ inch long).

Occurrence.—ZION.

5. DOUGLAS RABBITBRUSH (*Chrysothamnus viscidiflorus* (Hook.) Nutt.).—A very variable species with many varieties; shrub 1½ to 4 feet high, the stems white or pale green; leaves narrowly linear to oblong-lance-shaped, ¾ to 2½ inches long, 1- to 3-nerved (or 5-nerved in variety), often twisted, smooth but sticky; flower heads borne in broad spreading, oblong to rounded or flat-topped clusters, the flowering branches rather glutinous; involucre about ¼ inch high, the bracts oblong to linear, boat-shaped, not ridged on the back, arranged in poorly defined vertical rows; flowers about 5 to a head; seed-like achenes usually densely hairy. A chewing gum made from the roots of this plant was used by the Indians of certain regions of the Southwest.

FIELD GUIDE TO THE VARIETIES

Leaves somewhat glandular or sticky-glutinous, not hairy or hairy only on the margins; branches of flower clusters not hairy.

Leaves dark green, 4/5 to 2 inches long, linear or linear-lance-shaped.

Plants mostly more than 1½ feet high ..... 5. *C. viscidiflorus.*

Plants less than 1½ feet high ..... 5a. Var. *pumilus.*

Leaves pale green, narrowly linear-filiform, ⅜ to 1-1/5 inches long, the margins usually inrolled ..... 5b. Var. *stenophyllus.*

Leaves, at least the upper, more or less hairy; branches of flower-clusters hairy.

Leaves densely rough-hairy, usually not twisted; bracts of involucre not thickened at tips ..... 5c. Var. *lanceolatus.*

Leaves finely hairy, usually twisted; bracts of involucre with a somewhat thickened spot at tips ..... 5d. Var. *elegans.*

Occurrence (*C. viscidiflorus*).—LASSEN. YOSEMITE: east of Yosemite Valley. YELLOWSTONE: north of Mammoth auto camp. GRAND TETON. ROCKY MOUNTAIN, rare: near Eagle Cliff; Estes Park, 7,500 feet. BRYCE CANYON.

5a. MOUNTAIN RABBITBRUSH (Var. *pumilus* (Nutt.) Jepson).—Low

shrubs up to about 12 (or 15) inches high with slightly sticky-glandular foliage; leaves linear or linear-lance-shaped, 4/5 to 1½ inches long, often twisted, the margins with short stiff hairs; flower-clusters small, but sometimes open, the branches smooth; dry hills and plains.

Occurrence.—YELLOWSTONE: Mammoth Hot Springs. ROCKY MOUNTAIN. BRYCE CANYON.

5b. SMALL RABBITBRUSH (Var. *stenophyllus* (Gray) Hall).—Low shrubs 4 to 12 inches high with rather pale green, sticky-glandular foliage; leaves ⅜ to 1 1/5 inches long, narrowly linear with inrolled margins, 1-nerved, not hairy; flower-clusters small, compact, the branches smooth; rocky slopes and dry ridges.

Occurrence.—GRAND CANYON.

5c. LANCELEAF RABBITBRUSH (Var. *lanceolatus* (Nutt.) Hall).—Low shrub 2/3 to 2 feet high; herbage densely hairy; leaves broadly linear to linear-lance-shaped, ¾ to 1¾ inches long, 3- to 5-nerved, usually not twisted; flower clusters small, compact, the branches densely hairy.

Occurrence.—MESA VERDE.

5d. Var. *elegans* Greene.—Plants rarely more than 1½ feet high; leaves linear, sharp-pointed, 2/3 to 1½ inches long, 1- to 3-nerved, finely hairy above, usually much twisted; bracts of involucre lance-shaped, with a greenish or brownish thickened spot just below the tip; flower clusters small, compact, the branches densely hairy; in dry valleys and on plains.

Occurrence.—GRAND CANYON.

6. GREENE'S RABBITBRUSH (*Chrysothamnus Greenei* (Gray) Greene).—Similar to *Chrysothamnus viscidiflorus,* particularly the variety *stenophyllus,* because of its low bushy form, the white-barked stems and narrowly filiform leaves, but differs in having the bracts of the involucre tapering to a slender point.

Occurrence.—CRATER LAKE. GRAND TETON.

GOLDENWEED (*Aplopappus* Cass.)

There are numerous species of goldenweed in the western United States, only a rather small proportion of them being shrubs or semi-shrubs. Most of the shrubby species are conspicuous usually during late summer when the bushes are covered with heads of golden-yellow flowers, hence the common name, goldenweed. Some of the species are compact, round-topped bushes; others are erect and more loosely branched. The leaves may be linear, wedge-shaped, or oblong and may be toothed or lobed or not toothed. Some of the species might be confused with the rabbitbrushes which have numerous small heads of yellow flowers, but the heads of the goldenweed are usually broader, more top-shaped or bell-shaped and the involucral bracts are not arranged in such distinct longitudinal rows. In most of the species the petal-like ray flowers are present, but there are some exceptions. The goldenweeds could

never be confused with sagebrush which has a strong aromatic odor nor with *Acamptopappus* which has conspicuous globose heads with fringed involucral bracts. They may be distinguished from the snakeweeds by the numerous white hair-like pappus bristles. The pappus of the snakeweeds consists of several short scales. (Syn. *Haplopappus*.)

FIELD GUIDE TO THE SPECIES

A. LEAVES NOT TOOTHED, LOBED, NOR DIVIDED.

Flower heads small, mostly 1/6 to nearly 1/3 inch high, borne in compact flat-topped clusters; involucres surrounding the flower heads narrowly top-shaped; leaves conspicuously dotted with small resin pits; petal-like ray flowers lacking (rarely present in *A. cuneatus*); found in California parks.

Leaves narrowly linear ..... 1. *A. arborescens.*

Leaves spatula-shaped or wedge-shaped ..... 2. *A. cuneatus.*

Flower heads larger, mostly 1/3 to 3/4 inch high, borne singly or in loose clusters; involucres narrowly bell-shaped to broadly hemispheric; leaves not dotted with resin pits (except *A. linearifolius*); species not restricted to California parks.

Leaves dotted with conspicuous resin pits; petal-like ray flowers present; bracts of involucre papery white; large or medium-sized shrubs ..... 3. *A. linearifolius.*

Leaves not dotted with resin pits, sometimes sticky-glandular; low shrubs or semi-shrubs.

Heads borne singly on nearly naked stems; involucre of pale papery bracts; plants low, scarcely shrubby; ray flowers present.

Involucral bracts sharp-pointed at the tips, often with middle part greenish, not green at tips; outer bracts not regularly shorter ..... 4. *A. acaulis.*

Involucral bracts blunt at tips, the outer regularly shorter, greenish at the tips ..... 5. *A. armerioides.*

Heads borne on leafy stems or in leafy clusters; involucre of loose bracts, these often leaf-like.

Stems densely white-felty; leaves green, glandular; petal-like ray flowers lacking ..... 6. *A. macronema.*

Stems only thinly if at all white-woolly (white-woolly in one var. of *A. Bloomeri*); ray flowers usually present.

Heads large, 20- to 40-flowered; bracts of involucre not overlapping in unequal rows ..... 7. *A. suffruticosus.*

Heads smaller, 6- to 23-flowered; bracts of involucre loosely overlapping in unequal rows.

Bracts of involucre papery, only the tips green, the margins frayed; leaves usually not more than about 1/6 inch wide ..... 8. *A. Bloomeri.*

Bracts of involucre mostly green and herbaceous, the outer often leaf-like; leaves up to 1/4 inch wide; found at Crater Lake National Park ..... 9. *A. Greenei.*

B. LEAVES TOOTHED, LOBED OR DIVIDED.

Plants tall shrubs; flower heads small, cylindric, less than 1/4 inch broad; ray flowers none ..... 10. *A. acradenius.*

Plants scarcely shrubby; flower heads large, the involucres 3/8 to 3/4 inch broad, 1/4 to 1/2 inch high.

Leaves oblong-spatula-shaped, toothed, not lobed nor divided; ray flowers none ..... 11. *A. Nuttalli.*

Leaves deeply divided into several linear lobes; petal-like ray flowers showy ..... 12. *A. spinulosus* var. *Gooddingi.*

1. FLEECE GOLDENWEED (*Aplopappus arborescens* (Gray) Hall).—Dense round-topped shrubs, 1 to 7 (or 10) feet high, the main stems sometimes trunk-like; branchlets numerous and densely clustered; young stems and foliage somewhat resinous-spotted with fine punctate dots; leaves thickish, narrowly linear, the margins often rolled under so as to make them appear filiform, ½ to 2½ inches long, becoming smaller near the ends of the stems; flower heads about ¼ inch high, borne in dense rounded or more or less flat-topped clusters; involucral bracts lance-shaped, pointed, straw-colored, papery, borne in 3 or 4 series and overlapping; petal-like ray flowers lacking; achenes densely appressed hairy; pappus bristles dull white. This shrub occurs in the foothills in the southern Sierra Nevada parks of California, commonly in association with digger pine.

Occurrence.—YOSEMITE: El Portal, 2,000 feet; Big Oak Flat road. SEQUOIA, from lower elevations up to 4,500 feet: Colony Mill road; East Fork Kaweah River near Oak Grove (just west of park boundary).

2. WEDGELEAF GOLDENWEED (*Aplopappus cuneatus* Gray).—Compact, flat-topped shrub, 1/3 to 3 feet high; bark green, changing to brown and becoming irregularly broken in old stems; leaves cuneate (wedge-shaped), about ¼ to ½ inch long, resinous, marked with numerous small punctate dots, crowded on the stems; flower heads about 1/3 to ½ inch high, borne in groups of several in small flat-topped clusters at the ends of the branchlets; involucres top shaped, composed of numerous linear to oblong bracts overlapping in about 5 series; bracts papery, the inner with white membranous margins, sometimes resinous; petal-like ray flowers 1 to 3 or usually lacking; achenes somewhat 4-angled, silky-hairy; pappus bristles brownish. (Syn. *Ericameria cuneata* (Gray) McCl.).

Occurrence.—YOSEMITE, 3,600 to 7,000 feet: Hetch Hetchy; Yosemite Valley, near museum; Wawona Point, Mariposa Grove. SEQUOIA: Mount Whitney.

3. DESERT GOLDENWEED (*Aplopappus linearifolius* D. C. var. *interior* (Cov.) Jones).—Rigidly-branched shrub, 1 to 1½ feet high; bark greenish to grayish, becoming stringy on older stems; foliage covered with numerous small resin dots, more or less glutinous; leaves linear, ½ to 1 inch long, crowded on the branchlets; flower heads about ½ to ¾ inch high, with 10 to 18 petal-like ray flowers about ½ to ¾ inch long; involucre surrounding the head about 1/3 inch high, composed of several series of papery bracts, the bracts lance-shaped to linear, pointed at the tips; achenes nearly linear, narrowed towards the base, densely covered with silvery hairs; pappus composed of fine soft white bristles.

Occurrence.—ZION: Coalpits Wash.

4. STEMLESS GOLDENWEED (*Aplopappus acaulis* (Nutt.) Gray var. *glabratus* D. C. Eaton).—Low compact plant about 6 inches high, the stems

many from a branched woody base, often forming mats; leaves broadly reverse-lance-shaped, 1/3 to 1½ inches long, densely crowded near the base, becoming smaller and less crowded above until the stems are naked below the flower heads; heads usually borne singly at the ends of the branchlets, the involucres about 1/3 inch high and rounded at the base; bracts of involucre in 3 series, the outer shorter than the inner, more or less egg-shaped or narrowly so, tapering to a point at the tip, usually papery, sometimes greenish; petal-like ray flowers about 6 to 15; achenes more or less 4-angled, slightly tapering to the base, usually smooth or sometimes silky-hairy; pappus bristles soft and white or pale brownish. (Syn. *Stenotus falcatus* Rydb.).

Occurrence.—YELLOWSTONE: Mammoth Hot Springs.

5. DWARF GOLDENWEED (*Aplopappus armerioides* (Nutt.) Gray).—Low, scarcely shrubby plant 4 to 8 inches high, the stems arising from a woody base; leaves mostly basal, linear-spatula-shaped, tapering to the base, pointed at the tip, 1½ to 3 inches long, 3-nerved, smooth but sometimes resinous; flower heads large, the involucres broadly bell-shaped, about ⅜ to ½ inch high and about as broad; involucral bracts overlapping in 3 or 4 series, broadly oblong to oval, smooth and slightly glutinous, pale, the blunt tips greenish; petal-like ray flowers 8 to 15, about ½ inch long; seed-like achenes flattened, about 4½ mm. long, densely silky hairy; pappus bristles soft, white, abundant. (Syn. *Stenotus armerioides* Nutt.)

Occurrence.—MESA VERDE. BRYCE CANYON.

6. WHITESTEM GOLDENWEED (*Aplopappus macronema* Gray).—Low round-topped shrub ½ to 1½ feet high with numerous short clustered branchlets; twigs densely white-woolly, the wool becoming thinner or altogether lacking near the heads, then somewhat glandular; leaves oblong, pointed at the tips, 1/3 to 1 1/3 inches long, glandular, linear and somewhat white-woolly in var. *linearis* (Rydb.) Hall; heads borne singly or several at or near the ends of the branchlets; involucre 1/3 to ½ inch high, the bracts oblong to lance-shaped, pointed, papery or the outer green herbaceous, all exposed parts glandular or woolly; petal-like ray flowers lacking; achenes densely hairy; pappus bristles soft, dull white. (Syns. *H. discoideus* Gray, *Macronema discoidea* Nutt.)

Occurrence.—YOSEMITE, 8,000 to 11,000 feet: Half Dome; summit of Cloud's Rest; Mount Dana; above Fletcher Lake. KINGS CANYON: Harrison Pass trail. SEQUOIA, 10,000 to 12,000 feet: Siberian Pass. YELLOWSTONE (var. *linearis*): Yellowstone Lake. GRAND TETON (var. *linearis*).

7. SINGLEHEAD GOLDENWEED (*Aplopappus suffruticosus* (Nutt.) Gray).—Low, broad bush, ½ to 1½ feet high, with many branches from a woody base; bark at first green, becoming brown or reddish, at first smooth, becoming scaly in the older stems; twigs somewhat glandular-hairy especially near the heads; leaves oblong (or linear in var. *tenuis*), ½ to 1½ inches long, finely glandular; flower heads borne singly or in groups at the ends of the stems which are leafy to the tips; involucre usually about 1/3 inch high with the bracts all about the same length, oblong (or linear in var. *tenuis*), green,

herbaceous; petal-like ray flowers usually present but not conspicuous; achenes silky-hairy; pappus bristles fine, soft and white.

Occurrence.—YOSEMITE, about 10,000 feet: above Fletcher Lake; 5 miles west of Ireland Lake. SEQUOIA: near Farewell Gap (outside Park boundary). YELLOWSTONE: Electric Peak, 8,500 feet. GRAND TETON: Taylor Peak, 7,800 feet.

Var. *tenuis*, with linear leaves and smaller heads. YOSEMITE: Mount Hoffmann, near May Lake, 9,800 feet; Mono Pass; Mount Gibbs; Mount Dana. SEQUOIA: Mount Guyot, 10,950 feet; near Farewell Gap (outside park boundary.).

8. RABBITBRUSH GOLDENWEED (*Aplopappus Bloomeri* Gray).—Low, round-topped shrub, 1 to 2 (or 3) feet high, with numerous clustered ascending branches; bark reddish-brown, becoming dull and shreddy on old stems; leaves green, the upper somewhat sticky-glandular or white-woolly (all white-woolly in var. *Sonnei*), narrowly oblong to linear (filiform and often curved in var. *angustatus*), ¾ to 2 inches long; flower heads borne along the upper part of the branchlets, forming oblong leafy clusters; involucre about 1/3 to 1/2 inch high, the bracts loosely imbricated in several series, the outer linear lance-shaped with green, herbaceous, usually spreading tips, the inner oblong-lance-shaped, pointed, papery, the margins somewhat frayed; petal-like ray flowers 1 to 5 or lacking; achenes densely hairy to glabrous; pappus bristles fine, soft, white or becoming dingy-looking. (Syn. *Chrysothamnus Bloomeri* (Gray) Greene.)

FIELD GUIDE TO THE VARIETIES

Leaves green, the upper somewhat glandular or white-woolly.
Leaves narrowly oblong to linear ..... 8. *A. Bloomeri.*
Leaves very narrowly linear or filiform ..... 8a. Var. *angustatus.*
Leaves all white-woolly ..... 8b. Var. *Sonnei.*

Occurrence (*A. Bloomeri*).—CRATER LAKE, 6,000 to 7,500 feet: rim of Crater Lake; flat below Crater Lake Lodge; park headquarters; Bald Crater; Sand Creek above the Pinnacles; Timber Crater; Copeland Creek. LASSEN, common, 6,000 to 7,000 feet: mouth of West Fork Hat Creek; Cinder Cone area; Lost Creek below Raker Peak. YOSEMITE, 6,000 to 9,500 feet: South Fork Illilouette Creek; Little Yosemite; Merced Lake trail; north of Irving Bright Lake; Sentinel Dome; southeast corner of park on ridge between Buena Vista and Ottoway Creek. SEQUOIA: Chagoopa Plateau, 10,000 feet.

8a. NARROWLEAF GOLDENWEED (Var. *angustatus* Gray).—Leaves very narrowly linear or filiform; usually curved and spreading.

Occurrence.—CRATER LAKE: Wheeler Creek at the Pinnacles; Sand Creek; Sun Creek; Annie Creek at south entrance to park; vicinity of Crater Peak. LASSEN: Lassen Peak; Devastated Area. YOSEMITE: most of the specimens listed under the species are very close to var. *angustatus*. SEQUOIA: Soda Spring Meadow, Kaweah River Basin, 11,000 feet.

8b. WOOLLY GOLDENWEED (Var. *Sonnei* Greene).—Leaves densely white-woolly.

Occurrence.—YOSEMITE: Clark Creek drainage, 7,600 feet.

9. GREENE'S GOLDENWEED (*Aplopappus Greenei* Gray).—Similar to *Aplopappus Bloomeri*, but plants usually smaller; involucral bracts mostly

green and herbaceous, the outer sometimes leaf-like; leaves wider than in *A. Bloomeri*, 1/8 to 1/3 inch wide. At Crater Lake National Park this species intergrades with *A. Bloomeri*.

Occurrence.—CRATER LAKE: rim of Crater Lake, near Lodge.

10. PALELEAF GOLDENWEED (*Aplopappus acradenius* (Greene) Blake), fig. 144.—Erect shrub 2 to 3 feet high, the branches leafy to the tip; bark light straw-color, smooth or becoming grayish and shreddy; leaves 1 to 2¾ inches long, oblong, tapering to a narrow base, the margins sharply toothed with broad teeth or irregularly divided into several spreading narrow lobes sometimes as much as ½ inch long, the teeth or lobes tipped with a slender point; stems usually with several reduced leaves clustered in the axils of the main leaves; flower heads few to several, borne at the ends of short leafy branches on very short stalks or without stalks; involucral bracts overlapping in several lengths, stiffly papery, shiny, the margins thin; outer bracts somewhat thickened and greenish at the tips; petal-like ray flowers none; seed-like achenes slightly tapering to the base, densely covered with white hairs, pappus bristles numerous, unequal, brownish.

Fig. 144. Paleleaf goldenweed (*Aplopappus acradenius*).

Occurrence.—GRAND CANYON, common along streams and in gullies in the canyon, 2,500 to 4,000 feet: Bright Angel trail below Indian Gardens; Phantom Ranch; bridge near mouth of Bright Angel Creek; Kaibab trail along Bright Angel Creek for several miles above Phantom Ranch.

11. NUTTALL GOLDENWEED (*Aplopappus Nuttalli* T. & G.).—Low plant with spreading stems woody only at the base; bark gray to nearly white; leaves oblong-spatula-shaped, ¾ to 1½ inches long, hairy to rough-glandular or nearly smooth, the margins with low bristle-tipped teeth; heads borne singly or several at the ends of the branches; involucre ¼ to ⅜ inch high, about as broad; bracts few, overlapping in about 3 series, lance-shaped to

linear-oblong, sharp-pointed at the tips, mostly green, especially towards the tips, rough-glandular; ray flowers none; seed-like achenes densely hairy; pappus bristles unequal, some slightly flattened, reddish-brown.

Occurrence.—BRYCE CANYON. GRAND CANYON, on the North Rim.

12. IRONPLANT GOLDENWEED (*Aplopappus spinulosus* (Pursh) DC. var. *Gooddingi* (Nels.) Blake).—Stems erect or somewhat spreading from a woody base, 1 to 1½ feet high, the herbage bright green; leaves ½ to 2 inches long, deeply divided into several linear bristle-tipped lobes, the lobes often again toothed with narrow teeth; upper leaves smaller than the lower; heads borne singly at the ends of leafy or nearly leafless branches; involucre hemispheric, ¼ to nearly ½ inch high, ½ to ¾ inch across; involucral bracts numerous, linear, pointed, usually bristle-tipped, thin, the middle portion green; petal-like ray flowers 15 to 50, about ⅜ to ½ inch long; seed-like achenes narrowly top-shaped, densely hairy; pappus bristles unequal, rather scanty, brownish.

Occurrence.—GRAND CANYON, in the canyon, 3,000 to 4,000 feet: Kaibab trail on the Tonto south of the Colorado River.

RAYLESS GOLDENHEAD (*Acamptopappus sphaerocephalus* Gray).—Low, round-topped bush, 1 to 2 (or 3) feet high, much-branched, the older stems whitish, the bark becoming stringy; leaves small, about ¼ to ¾ inch long, oblong to linear, more or less erect along the branches; flower-heads more or less rounded, about ¼ to ½ inch wide, the heads borne along the upper parts of the stems and forming large more or less flat-topped clusters; flowers yellow; petal-like ray flowers lacking; bracts surrounding the heads papery, straw-colored or greenish, with fringed membranous margins, mostly rounded at the tips, loosely overlapping each other; small seed-like fruits (achenes) narrowly top-shaped, very densely white-hairy, the pappus bristles at the top of the achene white or somewhat tawny.

Occurrence.—ZION: hills above Coalpits Wash, 4,000 feet. GRAND CANYON.

ARROW-WEED PLUCHEA (*Pluchea sericea* (Nutt.) Cov.).—Slender erect shrub 3 to 10 feet high; leaves silvery-white but scarcely hairy, linear to lance-shaped, ½ to about 1½ inches long, not stalked; flowers purplish-pink; heads about ¼ to 1/3 inch high, hemispheric, borne in more or less oblong to rounded or flat-topped clusters at the ends of the branches; involucre composed of overlapping scales; seed-like achenes crowned with a single row of hair-like pappus bristles, occurs commonly on sandy washes or sand bars.

Occurrence.—ZION: mouth of Coalpits Wash, 4,000 feet. GRAND CANYON, in the Canyon, 2,500 feet: sandy wash along the Colorado River near the mouth of Bright Angel Creek; forms tall thickets at edge of trail along Bright Angel Creek near Phantom Ranch.

BUR-SAGE (*Franseria* Cav.)

There are two species of bur-sage in the parks, both found at Grand Canyon. The plants are low, rigidly-branched shrubs with a grayish aspect typical of many of the desert plants. The male and female flowers occur

separately on the same bushes. The male or staminate heads are borne in slender, nodding clusters or catkins while the female or pistillate heads, borne singly, become spiny bur-like structures which may adhere to fur of animals and thus aid in the dispersal of the seed.

FIELD GUIDE TO THE SPECIES

Leaves deeply once-to three-times divided; burs smooth or sparsely hairy ..... 1. *F. dumosa.*

Leaves merely lobed; burs white-cottony ..... 2. *F. eriocentra.*

1. WHITE BUR-SAGE (*Franseria dumosa* Gray).—Low, round-topped shrub; branches rigid, the older white, becoming spine-like at the tips; stems and herbage grayish-white with a fine close wool; leaves about ½ to 1 inch long, deeply and irregularly divided along the sides into several rounded lobes, these often again divided; fruiting heads with long straight spines, these sometimes sparingly hairy.

Occurrence.—GRAND CANYON, in the canyon.

2. WOOLLY BUR-SAGE (*Franseria eriocentra* Gray).—Similar to *Franseria dumosa* but the shrubs becoming 3 feet high; leaves egg-shaped to oblong, simple or irregularly divided into broad, shallowly toothed lobes, but not divided to the midrib; burs with long straight spines, covered with long, white hairs.

Occurrence.—GRAND CANYON, in the canyon: Clear Creek trail above Phantom Ranch.

MARIOLA PARTHENIUM, RUBBER PLANT (*Parthenium incanum* H. B. K.).—Low shrub about 8 to 12 inches high; leaves mostly basal, oval to elliptic, about ½ to ¾ inch long, irregularly few-lobed, whitish with a very fine felt; flower heads small, borne in flat-topped clusters at the ends of erect leafless flowering stems; flowers white; petal-like ray flowers very small and inconspicuous, scarcely exceeding the involucre, these the only fertile flowers; disk flowers in center not producing seeds; seed-like achenes hairy; pappus of 2 papery awns or scales.

This is a low inconspicuous shrub with whitish leaves mostly at the base. It belongs to the same genus as the Mexican rubber plant or "guayule" (*Parthenium argentatum*) from which rubber is obtained commercially. *P. incanum* has been used for the production of rubber also, but it is far less valuable than the Mexican species.[49]

Occurrence.—GRAND CANYON, in the canyon, 2,500 to 5,000 feet: Kaibab trail along switchbacks below Tip-off; near Phantom Ranch.

AMERICAN TRIXIS (*Trixis californica* Kell.).—Bushy shrub 1 to 3 feet high, the stems very leafy up to the flower heads; bark smooth, straw-colored or whitish; leaves narrowly egg-shaped to broadly lance-shaped, ¾ to 2½ inches long, very finely glandular-hairy, margins not toothed or with few

49 Wooten, E. O., and Standley, P. C., Flora of New Mexico: Contributions from the United States National Herbarium, vol. 19, p. 699. 1915.

teeth; flower heads about 1/2 to 3/4 inch high, these usually few in close clusters at the ends of the stems; flowers yellow, the corollas tubular, 2-lipped; involucral bracts oblong, of equal length, borne in a single series of 8 to 12, rather stiff and becoming straw-colored, surrounded below by several leaf-like bracts; seed-like achenes narrow, tapering towards the tip, finely glandular-hairy; pappus bristles soft, numerous.

Occurrence.—GRAND CANYON, common in the canyon, 2,500 to 3,700 feet: Bright Angel trail below Indian Gardens; Kaibab trail below the Tonto on both sides of the Colorado River.

BRICKELLIA (*Brickellia* Ell.), (Syn. *Coleosanthus* Cass.)

FIELD GUIDE TO THE SPECIES

Leaves linear to oblong-lance-shaped, toothed or not toothed; flowers white.

Leaves linear to narrowly lance-shaped, dark green, smooth, sticky-glutinous, 2 to 4 inches long, the margins finely toothed; heads 3- to 7-flowered ..... 1. *B. longifolia.*

Leaves oblong-lance-shaped, grayish-hairy and somewhat glandular, 1/2 to 1 1/2 inches long; heads many-flowered ..... 2. *B. oblongifolia* var. *linifolia.*

Leaves triangular or egg-shaped to rounded, coarsely toothed.

Leaf-blades 1/4 to 1/2 inch long, 1-nerved; flowers white ..... 3. *B. desertorum.*

Leaf-blades mostly 1/2 to 2 inches long, 3-nerved; flowers white to whitish, or yellow.

Leaves roughish, not sticky; flowers white or whitish ..... 4. *B. californica.*

Leaves smooth or sticky and hairy.

Herbage sticky and hairy; flowers white or whitish ..... 5. *B. Greenei.*

Herbage not sticky nor hairy, the leaves crisp and smooth, yellowish-green, with very prominent veins on both sides; flowers yellow ..... 6. *B. atractyloides.*

1. LONGLEAF BRICKELLIA (*Brickellia longifolia* Wats.).—Erect shrubs 2 to 6 feet high, usually with several straight stems from the base; old stems white, leafless during the winter, very conspicuous in the spring as the leaves begin to appear; leaves numerous, drooping, tending to be clustered towards the ends of the stems, lance-shaped to linear, about 2 to 4 inches long, smooth, dark green and glutinous above, paler below, the margins toothed; heads borne in small clusters along the flowering branches, 3- to 7-flowered, the flowers white; involucral bracts overlapping in several series; seed-like achenes crowned with a pappus of numerous hair-like bristles.

Occurrence.—ZION: Narrows trail near Zion Stadium. GRAND CANYON, abundant in the canyon, 2,500 to 6,000 feet: Bright Angel trail near trail shelter 1 1/2 miles above Indian Gardens; Garden Creek; River Trail; Kaibab trail just below Cedar Ridge; Kaibab trail between Phantom Ranch and junction of Roaring Springs trail.

2. MOHAVE BRICKELLIA (*Brickellia oblongifolia* Nutt. var. *linifolia* Rob.).—Round-topped bush 1/2 to 1 foot high, woody at base; herbage grayish-hairy and somewhat glandular; leaves broadly oblong-lance-shaped to linear, blunt-pointed at the tips, 1/2 to 1 1/2 inches long, sometimes with 1 or 2 short teeth; flowers white, many in a head surrounded by a bell-shaped involucre; bracts of involucre linear, with 2 to 4 longitudinal striations, the inner longest

with very slender tips; heads ½ to ¾ inch high, borne singly at the ends of sparsely leafy stems.

Occurrence.—ZION. GRAND CANYON, in the canyon just below the rims, 6,500 to 7,500 feet: upper Bass Canyon; Point Sublime.

3. DESERT BRICKELLIA (*Brickellia desertorum* Cov.).—Low spreading shrub about 4 feet high; bark finely white-woolly; leaves egg-shaped, coarsely toothed, blunt-pointed; 1/6 to 1/3 inch long; flowers white, 8 to 12 in a head; heads ¼ to 1/3 inch high, borne in small rounded clusters at the ends of short side branches.

Occurrence.—ZION.

4. CALIFORNIA BRICKELLIA (*Brickellia californica* Torr. & Gray).—Bushy shrub 2 to 3 feet high; herbage rough-hairy with fine hairs; leaves rounded to triangular, with 3 prominent veins, irregularly toothed, ½ to 2¼ inches long; flowers whitish, the heads in glomerules of several, these borne along the stems and forming rather narrow more or less leafy clusters; heads

Fig. 145. Stiff-leaf brickellia (*Brickellia atractyloides*).

about ½ inch high, 10- to 15-flowered, often somewhat nodding; bracts of involucre with thin blunt tips; seed-like fruits (achenes) with hair-like pappus bristles white or more or less tawny.

Occurrence.—YOSEMITE, near western park boundary up to about 3,000 feet. KINGS CANYON: Kings River Canyon. SEQUOIA: Paradise-Castle Creek trail, 5,000 feet. ZION: The Narrows, along trail. GRAND CANYON, common in the canyon, 3,200 to 6,500 feet: Bright Angel Trail; Indian Gardens; Kaibab Trail along ridge above Tip-off; above Roaring Springs.

5. MOUNTAIN BRICKELLIA (*Brickellia Greenei* Gray).—Low bushy plant ¾ to 1½ feet high, woody below; herbage sticky-glandular; stems very leafy; leaves egg-shaped, mostly toothed, ½ to 1 inch long, on very short stalks; flowers whitish, the heads borne singly at the ends of the stems or arranged in flat-topped clusters at the ends of side branches; involucres about ½ inch high, the bracts linear, slender-pointed, with 2 to 4 longitudinal striations.

Occurrence.—LASSEN: Lassen Peak, to 8,000 feet.

6. STIFF-LEAF BRICKELLIA (*Brickellia atractyloides* Gray), fig. 145.—Low round-topped shrub 1 to 1½ feet high with slender brittle branches; bark shreddy-scaly; leaves egg-shaped to triangular, ½ to 1 inch long, crisp, light yellowish-green, with very prominent veins, the margins irregularly toothed; heads about ½ inch high, broadly cylindric, the flowers yellow, fading to a dingy white upon drying; involucral bracts somewhat unequal in length, the outer oblong to elliptic, blunt-pointed, the inner a little longer, lance-shaped to linear; seed-like achenes linear, dark brown, the longitudinal ridges finely rough-hairy; pappus of numerous white hair-like bristles.

Occurrence.—GRAND CANYON, common in the canyon, 2,500 to 3,500 feet: Bright Angel trail near the Colorado River; Kaibab trail just below the Tonto south of the river; Bright Angel trail about 2 miles above Phantom Ranch; Clear Creek trail below Phantom Point.

BACCHARIS (*Baccharis* L.)

FIELD GUIDE TO THE SPECIES

Plants erect, 5 to 12 feet high; twigs not 4-angled; leaves conspicuous.
- Leaves lance-shaped, dark shiny green and sticky-glutinous above, the margins toothed; flower clusters more or less flat-topped or rounded ..... 1. *B. glutinosa.*
- Leaves mostly oblong, pale green, not glutinous, the margins irregularly few-toothed; flower clusters oblong, spreading ..... 2. *B. Emoryi.*

Plants intricately branched bushy shrubs, 1½ to 4 feet high; stems 4-angled; leaves small and inconspicuous ..... 3. *B. sergiloides.*

1. SEEPWILLOW BACCHARIS (*Baccharis glutinosa* Pers.).—Erect or straggling bushes 3 to 12 feet high with slender erect stems clumped at the base; leaves narrowly oblong to lance-shaped, 1½ to 6 inches long, dark shiny green and sticky-glutinous above, 3-nerved from the base, the margins toothed; flowers white or greenish, borne in small tight heads, the male and female heads on separate bushes; seed-like achenes very small, with a tuft of silky white hairs at the top, packed together into soft brush-like heads and the

heads forming more or less flat-topped clusters at the ends of the branches.

This is a shrub of the Southwest, occurring typically around springs, along streams, or on alluvial plains, where it is found growing in clumps or forming extensive thickets. The leaves resemble willow leaves but with a rather sticky-glutinous upper surface. The foliage is poor or worthless as forage but the deep and wide-spreading roots make the species useful as a soil binder on the sandy washes in the Southwest. The Indians sharpened the pithy stems and used them as brushes for decorating pottery.[50]

Occurrence.—ZION, 3,600 to 4,500 feet: Coalpits Wash near south entrance road; along river in front of Zion Lodge. GRAND CANYON, common along streams in the canyon, 2,500 to 3,500 feet: Bright Angel trail along Pipe Creek; Havasu Canyon; Phantom Ranch; Bright Angel Creek for several miles above Phantom Ranch.

Fig. 146. Mohave aster (*Aster abatus*).

2. EMORY BACCHARIS, WATER WILLOW (*Baccharis Emoryi* Gray). — Erect shrub 5 to 12 feet high with slender branches, or sometimes almost tree-like; upper leaves mostly linear or oblong; lower leaves elliptic to oblong, 1 to 1½ inches long, 3-nerved from the base, the margins irregularly few-toothed; flowers white, in small tight heads; heads borne in large oblong leafy clusters at the ends of the branches, the staminate (male) and pistillate (female) on separate plants; seed-like achenes small, tipped with numerous silky white hairs and packed together into slender brush-like heads about ½ inch long.

This shrub favors moist situations but may be found also in dry gravelly or clay soils. It is generally not considered a good browse plant but animals eat the herbage sparingly.

Occurrence. — ZION, present at low elevations along streams: Coalpits Wash, 3,600 feet. GRAND CANYON, common along streams in

50 Range Plant Handbook, B 33: United States Department of Agriculture, Forest Service. 1937.

the canyon, 2,300 to 3,800 feet: Garden Creek near Indian Gardens; Pipe Creek; Shinumo Creek; Bright Angel Creek at Phantom Ranch and for several miles above.

3. SQUAW BACCHARIS, SQUAW WATERWEED (*Baccharis sergiloides* Gray).—Much-branched broom-like shrub little resembling the other species of *Baccharis*; bushes 1½ to 4 feet high in our area; branches green, 4-angled; herbage glutinous; leaves rather sparse, narrowly oblong to spatula-shaped, ½ to 1 inch long, the margins not toothed or with few teeth; flower heads small, borne in nearly leafless branched clusters; involucral bracts stiff, oblong-egg-shaped; seed-like achenes smooth; pappus bristles rather stiff and sparse in the staminate (male) flowers, becoming slightly wider towards the tip, that of the pistillate (seed-bearing) flowers hair-like and the bristles more copious.

Occurrence.—GRAND CANYON, occasional in the canyon, 2,500 to 3,500 feet: Bright Angel trail along upper switchbacks above Pipe Creek; Kaibab trail along switchbacks below the Tip-off; Phantom Ranch; Kaibab trail along Bright Angel Creek about 2½ miles above Phantom Ranch.

MOHAVE ASTER (*Aster abatus* Blake), fig. 146.—Low bushy plant 1 to 2 feet high, with wiry branches spreading from a woody base; bark smooth, whitish; leaves 1½ to 3 inches long, lance-shaped to oblong, the margins spine-toothed; flower heads showy, about 2 inches across; ray flowers bluish-violet, the centers yellow. (Syn. *Aster tortifolius* (T. & G.) Gray.)

Occurrence.—GRAND CANYON, in the Canyon: Kaibab Trail below the Tonto on the south side of the Colorado River.

BRITTLEBUSH, INCIENSO (*Encelia* Adans.)

FIELD GUIDE TO THE SPECIES

Leaves green, roughish; flower-heads without ray flowers, borne singly at the ends of the branches ..... 1. *E. frutescens.*

Leaves white-woolly; flower-heads with ray flowers, borne several on short branchlets at the ends of the stems ..... 2. *E. farinosa.*

1. SMOOTH BRITTLEBUSH (*Encelia frutescens* Gray).—Low round-topped shrubs, mostly 1 to 3 feet high; leaves green, egg-shaped to oblong, with 3 main veins from the base, the margins not toothed; flowers yellow, the heads about ½ inch across, without petal-like ray flowers, borne at the ends of long naked stems which stand out above the rounded and often rather dense crown of foliage; bracts of involucre surrounding the heads dry and papery with conspicuous longitudinal striations, the margins hairy; seed-like achenes black, without a pappus crown or rarely with 2 slender hairs.

Occurrence.—ZION, GRAND CANYON, common in the canyon, 3,000 to 4,000 feet: Indian Gadens; Kaibab trail on the Tonto on both sides of the Colorado River.

2. WOOLLY BRITTLEBUSH (*Encelia farinosa* Gray).—Similar to smooth brittlebush except the leaves whitish on both sides with a fine white wool; flower heads several on short branchlets at the ends of the erect naked stems, with 10 to 18 showy petal-like ray flowers.

Occurrence.—GRAND CANYON, common in the canyon, 2,500 to 3,500 feet: Bright Angel trail near Colorado River; Phantom Ranch; Kaibab trail several miles north of Phantom Ranch.

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